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NEW YORK REVIEW OF THE

TELEGRAPH AND TELEPHONE

ELECTRICAL JOURNAL.

AMES.

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Epigrammatic.

From the Boston Transcript.

He wins at last, who builds his trust
In loving words and actions just.

The winter blast is stern and cold,
Yet summer has its harvest gold.

Sorrow and gloom the soul may meet,
Yet love wrings triumph from defeat.

The clouds may darken o'er the sun,
Yet rivers to the ocean run.

Earth brings the bitterness of pain,
Yet worth the crown of peace will gain.

The wind may roar among the trees,
Yet great ships sail the stormy seas.

Full oft we feel the surge of tears,
Yet joy has light for all the years.

On every banner blazon bright,
"For toil, and truth, and love we fight."

THOMAS S. COLLIER.

The Teleradiophone.

M. Mercadier, the eminent French electrician, has ingeniously adapted the photophone of Professor Bell to telegraphy. In the Photophone a ray of light is reflected by a mirror, so as to fall upon the sensitive surface of a "selenium cell" joined up in the circuit of a voltaic battery and a speaking telephone. When the light strikes the cell its electric resistance is diminished, and a wave or pulse of current flows through the telephone, causing it to sound. By eclipsing the ray of light a great many times per second, this sound can be exalted into a continuous hum, like that of a tuning-fork, and by again occulting the intermittent ray for long and short intervals corresponding to the flashes of a signaling lantern, this hum or drone can be broken up into audible signals. Thus, if the Morse telegraphic code is used a short occultation, producing a short pause in the note of the telephone, will stand for a "dot," and a long occultation, producing a long pause, will stand for a "dash." This photo-electric telegraph is realized by M. Mercadier with the help of a gas flame forming the source of light, a mirror and lenses to direct its rays upon the selenium cell in circuit with a battery and the line wire. The beam is regularly eclipsed by means of a rapidly rotating disc, perforated with a circle of holes, and the telegraphic occultations of the intermittent beam are effected by means of a signaling key, which interposes a dead screen in the track of the light whenever the key is pressed. These apparatus form the transmitter, and the receiver at the other end of the line is of course the telephone, which is fitted with a resonator to reinforce the sound. There is no gain in such an arrangement over the ordinary telegraph now in use; but it has the merit of lending itself to multiple telegraphy. Thus by multiplying the number of transmitters at one end of the line and the number of telephones at the other, several different messages can be sent along the same wire at once. In order to do this it is only necessary to rotate the eclipsing wheels at different speeds, so as to produce notes of different pitch in the receiving telephones, and to fit each resonator so as to enhance a particular note. Then, although the complex current flows through all the telephones in turn, each telephone will only render to the ear of the clerk the particular note for which he listens, and the makes and breaks of that note will be interpreted as the message. Not only can several messages be sent in one direction along the same wire together, but from opposite ends simultaneously without confusion, and M. Mercadier reckons that with 10 transmitters and 10 receivers at each end of a line, he can send 200 dispatches of 30 words each per hour, or 100 words per minute, in either direction. The effects of induction, so troublesome in speaking by telephone, are not experienced in this process, owing to the employment of musical notes and resonators.

The Arago Dynamo-Electric Generator.

Among the numerous dynamo electric generators shown at the recent Paris Electrical Exhibition were two machines of American origin, which, under the name of the "Arago Disc Dynamo," were exhibited by the Whitehouse Mills Company, of Hoosac, New York. It comprises, as will be seen, two pairs of electro magnets, each having one end attached to the frame of the machine, and the other ends opposite to each other; these magnets are so wound that they present alternate polarities, and the polarity of each pair of magnets facing one another is of an opposite nature. The magnets are provided with sector-shaped pole pieces, which collectively form the greater part of a disc. Each pair of magnets having such pole pieces opposite to one another, it will be seen that, as they stand in the machine, they leave between a narrow parallel space. Within the magnet thus formed revolves a wheel or disc, in which are mounted a series of six sector-shaped bobbins. All six of these coils are wound in one direction, but are coupled up in such a way that a current passing through them in series would circulate through them in opposite directions. The six coils are held in positions by two plates on the driving shaft, and by the double copper ring that forms the periphery of the wheel.

The second and larger machine is constructed on the same principle, but involves more complication. In this generator there are six pairs of electro magnets, arranged as in the smaller machine, and furnishing six alternating magnetic fields. The revolving disc is also as already described, only it has eight coils with wooden cores. The commutator consists of 24 plates. The means employed for rendering the current continuous is the same in principle as that used in the Hefner Altenek machine. The space comprised between two coils of the disc is connected to three plates of the commutator in such a way that the latter forms three groups of eight plates each. The two brushes are always in contact with two plates corresponding to the line that divides the induction coils in two equal parts traversed by opposite currents. The armature of this machine has a special arrangement which does not belong to the smaller one; each of the coils of the armature is in two parts. The induced current set up in the more important of these parts produces a current that is thrown into the circuit of exterior work. The induction produced in the other portion creates a current that excites the electro magnets On account of this arrangement the collector is divided into two distinct parts, each corresponding to one of the circuits just mentioned. The brushes are mounted in a special way; their supports are fixed on a ring beyond the frame of the machine, and the brushes themselves are also carried by springs fixed to the ring. From the foregoing description it will be seen that the Arago disc dynamo is a self-exciting generator, the arrangement adopted involving the use of two sets of brushes and two commutators—one connecting the magnets with the exciting coils, and the other connecting the induction coils and the outer circuit. The frame on which the brushes are mounted can be turned round through a considerable angle, so as to adjust the brushes to the position of highest efficiency. It is stated that the larger of these machines, driven at a speed of 1,000 revolutions, can feed eight arc lights of average intensity, consuming about six horse power, but accurate data as to its capacity are wanting.—*Engineering, London.*

Telephone Conductor.

Mr. Edward Truman, of London, has been engaged on the manufacture of a good telephone conductor, composed of two or more wires, his object being to obviate induction. Mr. Truman constructs his conductor on the metallic circuit system of two wires wound in a spiral form, placed in one covering, the wires being kept equidistantly apart, and insulated from one another. He can, however, make his conductors so that they shall contain as many as six or even more wires, all of which shall be equidistant from one another, and insulated. One of the conductors, a mile long, containing six wires, said to be insulated from one another by about 6,000,000,000 of units, and from the water in which the conductor was laid by as many as 13,470,000,000 of units per statute mile, was recently tested at Mr. Truman's works at Vauxhall by some of the Post Office officials. The core of these conductors is made of solid gutta percha.

M. Cochery intends to spend the surplus of the Electrical Exhibition fund, which exceeds £16,000, in establishing a research laboratory of electricity.

It Has Come to Stay.

The Electric Light, after small beginnings and timid efforts, has at last gotten such a foothold as not to be easily bought off or readily frightened away. The flickering gaslight, with its yellow-jaundiced feeble ray, is soon to be superseded in our streets and public squares by the clear white flame of Electron's lamp. The darkened alley, the dimly-lighted court—fit rendezvous for the midnight assassin—is soon to be too glaringly brilliant for him to ply his nefarious vocation. The sleepy policeman will be ashamed to be seen nodding under the watchful eye of the vigilant electric light.

Soon, too, the dark counting-room will be made cheerful by the tiny incandescent thread of carbon, the parlor, the reception-room, the study, will, ere long, be all ablaze with a light so mild, so steady, so pure, and so health-giving, that even the healthful rays of the sun will be scarcely missed, even on a cloudy day.

The question naturally arises, Will this new visitor bring new and unforeseen dangers? Will it lay snares for us with which it will not be easy to cope? We know that the thoughtless, uninformed person will sometimes blow out his gas and retire to rest in his to-be-chamber of death, suffocation stealing over him so silently and slowly as not to awaken a suspicion of danger in the tired sleeper.

The electric light has no poisonous gas to escape into the ill-ventilated room. It cannot readily be blown out, but must be properly turned off; and even were it to burn for all time, the atmosphere would not thereby be at all poisoned.

The ignorant servant girl may leave the gas burning in your kitchen, a door may be opened and the flame blown out—the gas will still escape into the room—and if the door be closed will mingle with the atmosphere, and form such an explosive mixture that the slumbering embers in the grate or stove will ignite the mingled gas and demolish your house.

Again, your swinging gas-burner may be moved so near to a curtain as to cause it to take fire, and the pleasant home be reduced to ashes.

The incandescent lamp is inclosed in a sealed glass globe, and cannot come into hurtful contact with either curtains or furniture.

The electric lighting wires may be left naked, and they may be too near each other, and thus at times come harm. So the gas-pipe can be put up with leaky joints, with imperfect connection, but the gas engineer who would so do his work would be no more to blame than the electric engineer who in the installation of his wire system should leave them in dangerous proximity to one another, or unprotected by proper insulations.

In the infancy of the art, it is small wonder if such things sometimes arise, but as the electric engineer becomes more practiced in his profession he will see to it that all conductors are placed so far from one another that the difference of the potential likely to exist between them, either normally or abnormally, will be so great that accidents from this cause will be, by and by, an almost unheard-of thing.

It becomes the electric engineer to make himself practically and thoroughly acquainted with the electric tensions that are likely to exist in any part of a circuit, and to be able to measure or estimate them with a fair degree of accuracy.

The art of electric lighting is going to call for a class of measuring instruments quite different from those in ordinary telegraphic use, and of a somewhat coarser character, still having sufficient accuracy to subserve the purpose in hand.

For measuring the strength of the currents in use, I know of nothing better than the Poggendorff-Gaugain galvanometer, with two coarse wires of such diameter as not to be inconveniently heated by the currents which they are obliged to carry, which, as lamps are at present run, will seldom exceed fifteen to twenty-five webers.

A copper wire a tenth of an inch in diameter will carry this current without inconvenient heating.

Then, too, the rheostats used must have wires of larger size than the telegraphic engineer is accustomed to, and considerably more cumbrous, still they must be constructed and used; but there is this compensation, that the range of resistance required will not be so great as required in cables or other telegraphic work.

All these instruments will doubtless make their appearance as they are needed, and the fittest will survive.

[F, in *The Electrician.*

How to Make Permanent Magnets.

The quickest and best way to magnetize steel bars is to place them centrally in a suitable coil, and then connect the helix with the wires from a dynamo-electric machine or powerful battery for a few seconds, remembering to break the current before removing the magnet from the coil. If the source of the current is a dynamo-machine, the coil should be about two and a half inches long, and should consist of 10 or 12 layers of No. 12 magnet wire. If a battery is used, a coil an inch and a half long, composed of fourteen or sixteen layers of No. 16 magnet wire, will be the best. The internal diameter of the coil should be only large enough to admit the bars easily. A battery of six Grenet elements, each having an effective zinc surface of thirty square inches connected in series, will do the work very well on small magnets; such, for instance, as are used in telephones. Where a number of magnets are to be made at one time, the bars may be passed in a continuous line through the coil, always keeping three bars in contact, end to end, adding one above the coil before taking one off below. In this manner sixty bar magnets have been strongly charged in ten minutes.

Horseshoe magnets cannot be charged so readily. There are two or three ways of charging them. One way is to place them in contact with the poles of a very strong electro magnet, removing them after breaking the current; another method is to place each limb of the magnet in a coil adapted to the current used; and still another method is to employ a single coil, inserting one pole of the magnet into the coil in one direction, thus breaking the current, and inserting the other pole into the coil from the opposite direction. It is well to remember that the magnet will be very much impaired if the current is not broken before removing it from the coil.

The secret of success in charging magnets is to have a strong current. It is impossible to make magnets satisfactorily without this all-important requisite. As to the quality of steel best adapted to this purpose, machinery steel, hardened and not tempered, answers admirably. For horseshoe magnets, German spring steel is the best. Tool steel answers well if hardened and drawn to a straw color. The steel receives its maximum charge almost instantly. It is useless to allow it to remain under the influence of the magnetizing current more than a few seconds.

Telephoning 300 Miles Under the Ocean.

A recent cable dispatch received here says that telephone experiments between the shore in England and a cable ship 300 miles distant, have proved successful. The human voice was distinctly transmitted by means of an instrument of American invention.

Telegraphing from a Moving Train.

On September 27, through Messrs Dewey & Co., a patent was issued to a resident of Santa Barbara for a method of telegraphing from a moving railroad car. The invention enables each freight or passenger train to have its own telegraph office. Two wires are required instead of one, and those are suspended directly over the track, and above the moving train. They are parallel, and about eighteen inches apart. One wire is connected with a battery at the terminal station. They are so suspended that, by a somewhat ingenious arrangement, light-running wheels can run along them from one end of the road to the other. The wheels are insulated from each other, but are connected with wires that pass down the roof of the car to the operating instrument, and through it complete to the circuit. As the car moves, the wheels are drawn along the wires just above it, and a constant current of electricity is maintained between the initial and terminal stations, through the moving car.

The one great value of the invention will be its preservation of life and property by preventing collisions. Almost every day heart-rending accidents are recorded of colliding trains. A lightning express rushes over long stretches of road between stations without knowing what moment it may crash into an approaching train. Upon leaving a station all communication is cut off until it reaches the next station. With offices upon each moving train, and constant, uninterrupted communication—not only with the head office, but with all trains moving on the same track—collisions would be impossible. The clumsy and expensive machinery of running trains by means of wayside offices would be enhanced 500 per cent. over the present system. When not in use for railroad business, the lines can be employed for the transmission of ordinary messages.—*Santa Barbara (Cal.) Press.*

The New Atlantic Cable.

The steamship Faraday left the works of Messrs. Siemens Brothers, at Charlton, on the 11th inst., with the last portion of the new Atlantic telegraph cable, which is to be forthwith completed for the American firm of Gould & Co. The cable is of special kind, and remarkable for its strength, the shore end weighing eighteen tons per mile, and the deep-sea and intermediate sections corresponding. More than 1,100 miles have been taken on board, at the rate of fifty miles per day, and the cable when complete will be 3,000 miles in length. The Faraday has made three previous voyages on the same work, leaving the end of the cable on each occasion buoyed in the Atlantic, where it has endured the storms of the past year without the slightest injury. Mr. Jacob, chief electrician, and a large staff are conducting operations, and the ship is in command of Captain Maypee.—*Electrical Review.*

The Cooper Union.

The last monthly report of the curator of the Cooper Union, Professor J. C. Zachos, to the board of trustees shows a large increase in the number of readers. During January 47,643 persons visited the reading room on week days and 7,425 persons on Sundays, an average daily attendance of 2,203. Out of the 18,866 books given out, 2,041 were in the cheap form of the Franklin Square Library or Seaside Library editions.

The class in telegraphy numbers sixty members this year, about double that of last year, owing to increased accommodations provided during the summer. The literary class will celebrate Washington's Birthday as usual with literary exercises.

The Telephonic Question in Belgium.

The Telephonic service in Belgium is likely to form the subject of a debate in the Brussels Chambers. It is the evident intention of the Belgian Government to gain control of the telephonic service, and carry it on as a State monopoly.

The growth of the telephone service in Belgium has been very rapid, and forms a curious chapter in the history of modern industrial development. Four persons made application in 1879, for permission to lay down the wires for the service. Permission was granted, and central offices were immediately established in Brussels, Antwerp, Liége, Verviers, Ghent, and Charleroi. The public departments made extensive use of the system, and everything seemed satisfactory until a few weeks ago, when it was announced by the Government that the establishment of telephonic services in Brussels, Antwerp, etc., would be let out at public sale. The original parties who obtained the concession were supported by Messrs. Bède, Bouquié, Gotendorf, and the Bell Companies. The various branches in operation until the recent fusion were:

1. The Belgian Telephone Company, capital 400,000 francs. This company professed to have a service at Brussels only, and to have a factory of telephones, etc. This society sold out its rights to other companies, taking stock in part payment, and has now no pecuniary interest in the question.
2. La Société Générale des Téléphones had originally a capital of 700,000 francs. This company had services at Brussels, Ghent, Antwerp, Liége, Verviers, and Charleroi. It has since been absorbed, as will be seen below.
3. The Antwerp Bell Telephone Company.
4. The Brussels Bell Telephone Company.
5. The Verviers Bell Telephone Company.
6. The Liége Bell Telephone Company.

These four last were offshoots of the International Bell Company of New York. Companies Nos. 1, 2, 3, 4, and 5 effected a union, and contributed to form Company No. 7, the Belgian Bell Telephone Company, with a capital of 3,400,000 francs. It has unified the services in Brussels, Antwerp, Verviers, Charleroi, and Ghent. Liége maintains a double service—that just named and the local one. This Belgian Company is asking for the concession of Bède and Gotendorf.

There are also interested in the matter:

8. M. Bouquié and partners, who have the Belgian rights for the Edison patents. They have not established any service so far, but will be supported by the Crédit Général of Belgium in endeavoring to have the concession.
9. The International Company of Telephones, capital 10,000,000 francs. This company is operating throughout most of Europe, and has the workshops of the first company (No. 1), and is a large shareholder in the Bell Company (No. 7.)

We see, since writing the above, that the Société Générale has gone into liquidation, and that a new company, with a capital of 25,000,000 francs, has been formed.

Electrical Methods of Search for Bullets in the Body.

Professor Bell lately brought before the Paris Academy the modification of Hughes' induction balance, with which he proposes to find the position of a projectile in the body, and which consists essentially of two flat coils superposed, so that the edge of one is over the axis of the other, one coil receiving a vibratory current, while a telephone is the circuit of the other. The coils, mounted in a wooden case, are moved over the body; and, from the nature of the sounds heard when the ball is approached, the position of the latter can be inferred. A quite different electrical method, however, has also been devised by Professor Bell, suggested apparently by M. Trouvé's ingenious electric sounds or probes, in which two conductors are used, and the ball completes the circuit. Professor Bell inserts a fine needle in the suspected region. It is connected by wire with one of the binding screws of a telephone, which the surgeon holds to his ear, the other binding screw being connected with a metallic mass applied to the skin. When the needle point touches the ball, an electric couple is formed, and the current generates a sound in the telephone. The surgeon may then use his knife with confidence, guided by the needle. He may make several insertions of the needle, if necessary without danger, and any pain may be obviated by etherisation. This simple method (which should prove useful on the field of battle) was tried with success with a lead ball introduced into a piece of beef. Contact of the needle with bone had no effect, but a very distinct sound was heard each time the ball was reached. A modification consists in inserting a vibrator in the circuit; this gives a musical note in the telephone at each contact of ball and needle. Again, if the circuit include a battery, the telephone sounds may be heard by several persons at once. A sound is heard in this case whenever the needle enters the skin; but, on reaching the ball, it is much intensified owing to lessened resistance. A galvanometer may be used in place of the telephone.

Electric Light for Hell Gate.

It is to be hoped that Mr. Crapo's resolution referring to the lighting of Hell Gate by electricity may soon be acted upon. It is said that the officials of the light-house board are strongly in favor of the proposition, and it is quite certain that nowhere in the United States would this means of illumination be attended with greater results.

The Refraction of Electricity.

Mr. Alfred Tribe, who has published during the past few years a series of interesting researches in electro-chemistry, is about presenting to the Royal Society of London an important work in which he demonstrates that electricity, as light, sound, and heat, is capable of presenting the phenomena of refraction.

When a current traverses an electrolyte between two parallel electrodes, and in size equal to the section of the electrolyte, the molecular movement produced follows a direction perpendicular to the surface of the electrodes.

Mr. A. Tribe has assumed that if the electrolyte was composed to two media of different conductivity, the direction of the electric movement would deviate, like a luminous ray, in passing from one of these media to the other.

To prove this idea, he placed in an electrolytic cell, obliquely to the direction of the electrodes, a porous cup with parallel sides containing a liquid more dilute and consequently a poorer conductor than that in the cell. The current having been once established, he studied, by an especial method of analysis, the direction of the electrical motion in the different portions of the cell. In the better-conducting liquid of the battery the direction of the movement was found to be perpendicular to the electrodes, but in the poorer-conducting liquid of the porous cup this direction was changed, approaching to the normal at the surface of separation.

The case is thus shown to be the same as with light, heat, and sound; and Mr. Tribe has confirmed this conclusion by a large number of experiments too long to detail here.—*The Electrician.*

Automatic Block System of Electrical Railways.

It has been stated by Dr. Siemens that the method adopted by him for the electrical transmission of energy to a railway carriage to drive it, although efficient for tramways and very short lines of railway, is not suitable for railways of more than a few miles long. The public seem to have accepted this, as proving that ordinary railways cannot be worked by electricity. In two lectures which are to be delivered at the Royal Institution and the London Institution this session, the true state of the matter will be made clear; but the present seems a favorable time for hinting at the advantages which are derivable from the use of electricity on long railway lines. Let it be known that a railway of 200 miles long may be divided into sections, each of which is like the short line to which Dr. Siemens at present confines his attention. A train on section D, before it enters on section C, connects that section with the distant source of electricity, and disconnects the section behind it, E; but, should there be a train on the same line only two sections in advance—namely, on section A—the train on D is unable to connect C with the distant source, and, when it gets on this section, it must come to a stop. It not only comes to a stop from mere absence of power to drive it, but it comes to a stop because it is braked continuously in such a way that the stoppage from the highest speeds is effected in some twenty yards, without any perceptible shocks. In fact, Captain Douglas Galton's condition of no skidding is effected automatically, as the brake can only act when the wheels are revolving. We know of no eminent electrician who doubts the possibility of effecting this perfect block system on railways, if the railways are worked by electricity. All the electrical difficulties of the problem, even for crowded stations like Crewe, have already been worked out, and it is to be remembered that they are perfectly simple in comparison with the complications inherent in the connections between signaling arrangements and switches. A train is rapidly stopped on a section, which may be half a mile long, or only twenty yards longer than the train itself, if it is arranged that it ought not to pass beyond that section until something else has happened. To represent the nature of the stoppage which is effected, we have to imagine that the coals and hot water and steam are suddenly removed from an existing locomotive, and that all the energy of motion of the train is being converted into electricity, which acts energetically in stopping the train. This is not the place to describe how perfectly the energy now wasted in stopping a train at a station would be given to other trains on the line, nor how the clerk in London would see before him on a map of the railway a series of moving black shadows, each of which would indicate the position and motion of a train; nor is it our intention to speak of the great saving which would be effected in the cost of bridges and rails when the present heavy locomotives are entirely dispensed with. Even the absence of smoke and cinders is a secondary matter compared with the certainty of safety which would attend such an automatic block system as we have described; and we write in the hope that the importance of this matter may have some effect on the public mind, and help forward a change which it is very difficult to effect in a country which is already provided with railways.

W. E. Ayrton,
John Perry.

Lighting the Suez Canal.

A Bombay paper states that there is a fair prospect of the Suez Canal being lighted by electricity, so that ships may pass through it at night, instead of coming to anchor as at present. There is some prospect also of the lighting of the Suez Dock by electricity for the Peninsular and Oriental Company.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

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In this practical age progress is so rapid that, to give currency to new ideas and improvements as they obtain a foothold, nearly every large class of business has its representative newspaper, and, in many instances, several acknowledged journals, each treating wholly upon the topics pertaining to its specialty.

There are several journals claiming recognition in the electrical field, but not one that confines itself exclusively to these vast and important interests.

Recognizing the want of a *live*, enterprising journal to represent the Telephone and Telegraph as a distinct branch of business, we present this our first issue of the NEW YORK REVIEW OF THE TELEGRAPH AND TELEPHONE AND ELECTRICAL JOURNAL.

With the best facilities at our command, we propose to make this the standard Telephonic and Telegraphic Journal of America, and to this end shall direct all our efforts.

We shall also treat the subject of Electric Lighting fully, and illustrate the merits of the systems now accepted and in general use.

The present seems a peculiarly fitting period to start out upon the territory we have chosen.

The genius that has distanced the old world in useful and invaluable electrical inventions will brighten still more under the influence of these auspicious times of rapid advancement and activity in these branches of the electrical science.

To keep our readers informed as to the most important and valuable inventions pertaining to these subjects, giving suitable illustrations of new objects and discursive reviews of the same, is the principal purpose of this journal.

At the same time we shall always act independently, not holding ourselves under the least obligation to give "favorable notices" of anything under review, but rather to elicit the plain truth whether it be favorable or unfavorable.

Every review of an electrical object that appears in our columns will be prepared by a thoroughly competent party after a satisfactory examination.

To our many friends and patrons, who have so fully and so gratifyingly sustained and encouraged us in this undertaking, we return our sincere thanks, with assurance that their confidence is not misplaced.

The Multiple Switch Board for Telephone Exchange Offices.

The attention of the public has been drawn to the fact, recently, by the newspapers, that the rates for telephones in the larger cities were much higher in proportion to the number of subscribers connected, thus reversing the usual rule of business, according to which the more of any given article, or any service, that is called for and furnished, the cheaper it can be obtained. The reason for this appears upon very slight investigation; for, while the number of subscribers of a telephone exchange is only one hundred and fifty to two hundred, the number that can be called for at any one time can easily be managed, and the operation required for making the connection be done by perhaps a single boy or girl.

When the number of subscribers is larger, however, it will be seen that the number of connections that can be called for increase rapidly, and consequently the work of making the connections.

To meet the increased difficulties of handling large numbers of subscribers, various means have been suggested and tried, but none have theoretically or practically promised the success of the duplicate switch board.

The duplicate switch board, described briefly, is a means for making the terminals of the wires of subscribers appear at different boards, and be operated without interference.

The ingenious means by which this result is obtained we hope to describe more fully later, but at present it is sufficient to say that in practice it has been successful to use separate boards for the terminals, and that they have been operated without interference, thus enabling the switchman at either board to know at once whether the party wanted was busy, and, if not, to make the connection.

At the Telephone Exchange office, in Indianapolis, where the system has been most perfectly tried, the manager speaks most highly of this system. The time occupied in making the connection is less, probably, than that required in the ordinary telephone exchange of fifty or one hundred subscribers. In Chicago, also, the system has been tried, and has found favor, though the most improved apparatus for the purpose has not there been introduced.

As the telephone continues to grow in favor with the importance of the service in large cities, the question of the adoption of the duplicate board is only one of time.

The system, as is signified by the title, "Multiple Board," can be adapted to the use of three or four boards for the terminals of the wires, all working independently of each other. The practical telephone men have no difficulty in understanding the advantage derived from the distribution of force allowed by this board.

The Electric Railroad.

The snow fall has seriously interfered with the work of the new electric railway at Menlo Park. This is expected to reach completion in about two months. Its length will be about three miles, running from Menlo Park towards Plainfield, N. J.

Induction on Telephone Circuits.

One of the most effective remedies discovered as yet for getting rid of induction on telephone circuits has been devised by the French electrician, Foucault, who wraps the telephone wire with any good metallic conductor, such as tin foil, and connects the wrapping at intervals of every few miles with the earth. The current induced from other wires affects first the metallic wrapping, and as the tendency to seek the earth is stronger than to affect the wire, it runs to the earth. It has been found, however, that over long distances this metallic wrapping produces what is technically known as "retardation," the current becoming sluggish and unmanageable.

The Electric Light has come home, not only to the business but to the bosom of the whole civilized world. It is an interest which, like the sunlight itself, permeates everywhere, and is felt by everyone. It tells its own story to high and low, rich and poor, and carries its uses and conveniences to them all. It is already a familiar illumination in the cities of Europe and America, but the further it extends along the public streets and spreads into institutions, manufactories, shops, private dwellings everywhere, the more will invention and contrivance have to follow it, and the more will the people desire to be kept abreast with its progress by a faithful, popular, and scientific account of every step it makes on the way.

We tender our thanks to Horace B. Miller, Esq., and his able and efficient colleagues of the *American Machinist*, for their excellent counsel concerning the publishing business.

Our Telephone friends will be greatly benefited we think by subscribing to this REVIEW, as it will present to them semi-monthly all the *latest* and most important news concerning their particular branch of business, and all new inventions and improvements in instruments, and all appliances and apparatus used in Telephone Exchanges worthy of mention will be carefully examined and illustrated in this Journal.

We shall endeavor to uncover and show up the true inwardness of the organizers of a certain *soi-disant* Electric Light Company in our next issue; the matter came in too late for notice in this edition.

We regret that we are obliged to omit some articles, of interest to Telegraphers and our Telephonic friends, from this issue which did not reach us in time for publication.

A Canal to be Lighted by Electricity.

OTTAWA, Feb. 9.—The newly constructed part of the Welland Canal, for a distance of nine miles, is to be illuminated by electric lights.

The heading of our REVIEW, of which we are somewhat proud was executed by that Master Artist Penman, Daniel T. Ames.

Everything worth noting of interest to the patrons of THE TELEPHONE AND THE TELEGRAPH will be found in this paper.

When purchasing supplies of our advertisers we shall be obliged if you will kindly mention that you saw their advertisement in this paper.

Address all communications intended for this paper to George Worthington, proprietor and publisher, 23 Park Row. P. O. Box 3329, New York.

New Method of Regulating Clocks.

M. Lacoine, writing to *L'Electricien* on the use of the telephone in regulating clocks, says: "In regulating the time of office clocks, I found some difficulty on account of the irregularity of the frictions, when I made the contacts outside by the minute hands. It then occurred to me to place a telephone in the circuit, which enabled me to examine the defects in the contacts. After some experimenting I succeeded in obtaining perfectly regular contacts, but I had to use very flexible springs. Whenever the friction contacts are not good, a great many variations are heard in the telephone, as the contacts act in such cases like regular microphones. Sometimes the jerky, but regular, motion of the hand is heard distinctly; at other times loud sounds, which arise from momentary insulations or very resisting contacts, can be perceived. There is no sound when the contact is perfect, except that owing to the closing or interruption of the current, when two sharp knocks are given; but there is absolute silence while the contact is kept up by the movement of the hand. This method allows us to select the metals to be used, as well as their size and the strength of the springs, and I believe it may be utilized wherever easy and perfect contacts are required. I have lately made use of it for studying the contacts in an electric anemometer (with Robinson's rotary apparatus). The quality of rapid contacts can thus be ascertained at a distance, and timely steps taken to repair them.

The New Faure Accumulator.

After trying lead plates covered with minium and sheathed in flannel, then rolled into a spiral form for the Faure accumulator, recourse was had to square plates standing side by side. M. Emile Reynier, however, electrician to the Force et Lumière Company, has modified the battery by returning to the original shape of a spiral roll for the plates, and sheathing them in a sort of linen serge instead of flannel, after they have received their coat of minium. He also incloses the plates in a glass vessel instead of a wooden trough, principally because the electrician can more easily see if there is any discharge of gas bubbles from the plates. In charging, the appearance of these bubbles, if the cell is a good one, indicates that the supply of current ought to be suspended, because the cell is full. Should the bubbles appear before the charging is complete the cell is considered faulty. The reason of this is that the oxygen liberated on the electro-positive plate ought to be entirely used in oxidizing the minium, and it is only when that oxidation is complete that the gas should rise from the plate.—*Engineering.*

Extension of the Signal Service.

By Prof. John Trowbridge.

The Signal Service of the United States performs a great service to science by inculcating the value of scientific investigations. Observations in meteorology were formerly buried in the proceedings of learned societies, and met the eyes only of a few scientific men; now they are discussed at the breakfast tables of a million people. The departments of physics in our universities and technical schools have reason to thank the Signal Service for leading the public mind to see the importance of physical investigations to the ordinary pursuits of mankind. He, however, who endeavors to raise money at the present time to equip a physical laboratory in connection with a university will find that the Signal Service has still work to do among the practical business men of this country—men whose successful prosecution of their commercial enterprises depends upon the economical use of steam, upon careful scientific consideration of atmospheric changes, conditions of heat and moisture, and sanitary laws. There are men of this class who accept what they call progress, without inquiring into the causes of it, and who have never thought of physics as a science to which business is indebted for its successful prosecution "What is meant by the word physics?" asks the man who consults the paper to discover if the storm center which has been developed in Texas, and whose progress has been telegraphed, will probably strike his steamship, which is off Cape Hatteras. The steamship has recently been fitted up with the most approved compound engines, which have been perfected by the labors of those physicists, Rankine and Thomson. "What is meant by the word physics?" asks the manufacturer, with a telephone to his ear, listening to a response from his factory. The solicitor for the endowment of a physical laboratory has the satisfaction, even if he fails to obtain a subscription, of feeling that he is a public educator.

It is very probable that any plan for the extension of the Signal Service would meet with opposition, even among those who would be most benefited by such extension. Yet the demands of science are daily becoming more inexorable, and the progress of meteorology toward the stand-point of an exact science is assured by the labors of those who have charge of the Signal Service.

At one time most of our American colleges and universities conducted meteorological observations. These observations were industriously made and conscientiously carried on, but were very much like private measurements of rainfall and barometer heights—notes of the first coming of the golden robin in spring—and journals of cold or hot days. Meteorological observations which are not taken simultaneously over extended areas are of little value, save to the compilers of local almanacs. The Signal Service, having relieved four universities of their onerous meteorological responsibilities, doubtless feels indebted to them for pointing the way, and would be grateful if the universities could lead them one step higher, since it is one of the functions of a university to be always a little in advance of the ruling conditions of popular knowledge. Some plan of co-operation might be devised, by which the universities and colleges along our Atlantic sea coast could aid the Signal Service in testing the value of more delicate investigations upon atmospheric changes than can be carried on at the present Government stations. Harvard University, Yale, Columbia, Princeton Colleges, the University of Pennsylvania, and Johns-Hopkins University could, doubtless, provide suitable rooms and experienced assistants for testing the value of simultaneous observations upon various phenomena which are not at present taken into account in weather predictions. We judge at present of climatic changes by observations above ground; it may be that the presence of earth currents of electricity, of fluctuations in the earth's magnetism, of waves of heat through the superficial layers of the earth, may reveal important factors in announcing meteorological changes. Simultaneous observations upon the slight earthquake shocks, which are continually pulsating beneath the apparently calm surface upon which our great cities are built, may have important relations to conditions of heat and cold. The mere mention of these unobserved phenomena is sufficient to show the state of our ignorance, and to lead us to expect that investigations in physical laboratories will be of practical value in leading the Signal Service to extend its usefulness.

The electrical state of the air is supposed to have great influence upon the proper conditions for fair weather and for storms, and to also affect the states of health and disease; but no definite information has been collected which bears upon these points. The Signal Service would aid the science of meteorology very greatly by extending observations on the electrical state of the air over large areas of territory.

The apparatus for studying the electricity of the atmosphere is probably the most delicate and refined of any in the subject of electricity. Sir William Thomson's electrometer is an admirable instrument, wonderful in its details and in its scientific plan. It can be used, however, by any intelligent observer. In principle it consists merely of a suspended aluminum needle which swings between four hollow quadrants. The needle is put in constant contact with the inner coating—which consists of sulphuric acid—of a Leyden jar, by means of a small wire suspended from the needle. The diagonal quadrants are connected. If one pair is put in connection with the ground and the other pair connected with the body whose electrical state is to be tested, the aluminum needle by its deflection indicates the kind and amount of the electrical state. The needle is provided with a mirror, which allows its deflections to be observed by means of the reflection of a point of light. Although the principle is simple, yet the means for obtaining complete insulation and for keeping a constant charge in the needle are quite complicated. The Leyden jar can be charged by means of a small Holtz machine, or by means of an induction coil. A still better method of charging has been adopted by the continental physicists; this consists in the employment of a miniature water battery of five hundred or a thousand cells. Small glass vials, similar to those used by the homœopathists, are filled with distilled water, are placed in a wooden box, and are well insulated from each other. A sheet of zinc and copper are soldered together along their edges, and then cut into small couples of zinc and copper. These cells are coupled *seriatim*, or, as it is usually termed, for intensity. The entire battery need not occupy a space of more than a foot and a half square, and can be made even more compact. The statical charge at the terminals of this miniature battery is strong, and a Leyden jar or a condenser can be easily charged by connecting one terminal of the battery to the inner coating of the condenser, and the other to the outside coating. The electrometer jar is charged, therefore, in this way by being kept permanently connected with this battery.

The apparatus for collecting the charge of the air, in order to affect the charged needle, consists of an insulated tin can filled with water. The water is allowed to flow from this can by means of an horizontal glass tube, which is drawn out to a comparatively narrow orifice. The can is then connected by an insulated wire to one pair of the quadrants of the electrometer.

Since the original charge of the can and the water—all objects are necessarily charged with electricity to a greater or less extent—is dissipated by the flow of the water, the electricity of the air continually renews this loss, and the tin can finally takes the charge of the air in which it is placed. This method is very sensitive, and will detect discharges of lightning by a throb of the electrometer needle, even when the thunder-storm has not yet appeared above the horizon. A method of obtaining continuous registrations of the deflections of the electrometer-needle is necessary. This can be accomplished by receiving a spot of light, which is reflected from the mirror attached to the needle, upon a cylinder covered with sensitized paper. This cylinder is made to slowly revolve by clock-work, so that twenty-four hours' observations can be obtained. Nothing is so characteristic of modern methods in physical phenomena Early observers were forced to content themselves with scattered observations taken at different intervals, and important variations might occur at the times when no observer was watching the apparatus. Now the movements of the human heart can be recorded by a little apparatus which will combine in one curve a thousand continuous observations, and the slightest

anomalous fluctuations can be studied from the record which is obtained.

Provided, therefore, with these modern and more refined means of observation, we are in a condition to study the fluctuations of that subtle manifestation of energy which is ever present in the air, and seems to lurk in all matter. The influence of the electrical state of the air upon atmospheric changes is doubtless far-reaching. We are accustomed to think of thunder-storms as the only manifestations of atmospheric electricity; but there are influences which it exerts, more silent than those which are announced by the crackle of lightning, yet none the less extended. A pretty experiment, described by Lord Raleigh, illustrates the effect of electricity upon the coalescence of rain drops. A narrow stream of water is allowed to issue from a reservoir and form a parabola, which strikes the ground in drops about four feet from the orifice. When this is a fine stream, it breaks up into a shower of drops at about two feet from the orifice. On rubbing a bit of sealing-wax with a cloth, and presenting the rod of sealing-wax near the stream, the drops immediately cease to separate, and the stream is continuous from the orifice to the point where it strikes the ground. This is a very striking experiment, and undoubtedly has a bearing upon the formation of large drops of rain, which are often noticed during a thunder-storm after a discharge of lightning. Instead of a rod of sealing-wax, a piece of writing-paper can be readily charged by placing it upon a table and rubbing it vigorously with the palm of the hand.

None of the theories which endeavor to explain the source of the electricity of the air are satisfactory. Professor Tait, in a recent lecture, is of the opinion that evaporation is the source. Under the influence of the sun's heat, this operation of nature is conducted on an immense scale, and seems to him to be competent to furnish the supply of atmospheric electricity.

It is maintained by others that the atmosphere of the earth has a permanent charge, which it received in the beginning, or which was developed by cosmical changes; and this charge manifests itself here and there, and fluctuates under different conditions of heat and moisture. Mr. Aiken has lately broached a novel theory of the formation of fogs and rain-clouds, which also has an important bearing upon the theory of atmospheric electricity. He believes that dust, or impalpable saline particles, are necessary for the formation of clouds. Without dust, or these particles, we should always have cloudless skies. To prove this theory, he caused water to evaporate into two receivers, the air in one of which had been passed through cotton-wool and other media, to intercept the dust; in the other the air contained dust. The usual fog which is perceived when water is suddenly evaporated under a receiver was absent in the receiver whose air had been deprived of its dust, but was present as usual in the other receiver. Various experiments of the same nature were tried. Fog suddenly formed in the dust-deprived air of a receiver if a bit of wood was burned, and thus caused to throw off small particles; burning sulphur was very active in producing these fogs. The fogs of London are thus partially caused by the consumption of coal and the evolution of sulphurous gas, and the fogs along the sea-coast by the saline dust formed from the spray.

If this theory is a correct one, our views of the electrical charges upon different layers of air must be modified to a considerable extent. Some experiments are now being made in the Physical Laboratory of Harvard University to test the inductive capacity of dust-films, and also to trace the fluctuations in the electric spark when it is caused to pass through air deprived of its dust, and air which contains impalpable matter. In order to add to our knowledge of the electrical conditions of the air simultaneous observations are needed at a large number of stations. The cost of fitting up such stations would not fall short of six hundred dollars for each station, and the services of experienced observers would be necessary. It is not likely that the United States Government will establish such stations unless it can be shown that observations upon the electrical state of the air are important in predicting the path of storms. In the meantime, the various colleges in the different States might, by some system of co-operation with the Government, undertake such observations, since there are in nearly every college rooms and observers at command. As soon as it became apparent that the observations thus taken were of value, the interests of commerce would demand that they should become a part of the regular work of the Signal Service — *Popular Science Monthly.*

Effects of Transmitting Electrical Currents through Magnetized Electrolytes.

BY DR. G. GORE, F. R. S.

This communication treats of a class of electro-magnetic rotations observed and examined by the author. The rotations are produced in liquids by means of axial electric currents either in the interior or vertical magnets, electric or permanent, or near the poles of such magnets; and differ from rotations previously produced in liquids placed in those positions by the absence of radial currents, to the influence of which rotations in the interior of hollow magnets have hitherto been ascribed. In the full paper it is stated that "the whole of the results may be explained by the well-known principles of electro-magnetism."

It is here shown that a column of an electrolyte placed under similar conditions to an iron wire or rod when subjected to electro-magnetic torsion, (i. e., inclosed by an electro-magnetic helix, and traversed axially by an electric current), is twisted in a similar manner to the wire or bar. This effect, however, in the case of a liquid, is not limited to paramagnetic substances, nor is the direction of torsion altered by the magnetic character of the solution.

The rotations produced in liquids by means of axial currents are opposite in direction at the two ends of the magnet tube, are strongest at the poles and at a little distance beyond them, and null at the center of the tube;—they may be produced at a distance of several inches beyond the poles. The directions of rotation within the tube, and to a short distance beyond the poles, are, in the case of an electro or a permanent magnet, opposite to those produced by a voltaic solenoid; a magnet tube, therefore, has three points of no rotation with an axial current, viz: one at its center, and one near each end, whilst a solenoid has only the former one. The existence of the outer neutral points produced by a magnet depends upon the position of the latter to the liquid, and the distances of those points from the poles of the magnet are affected by various circumstances which are described in the communication. If the magnet is wholly above the portion of the liquid traversed by the axial current, the outer neutral points do not occur.

By the influence of a vertical current, the liquid as a whole may be made to rotate in either single direction; the motion at one end of the column, therefore, is not dependent upon the opposite direction of motion at the other, and torsion is not a necessary form of the effect. The reaction of the liquid in the production of the rotation is neither upon another portion of the liquid, nor upon the electrodes, nor upon the walls of the containing vessel, but upon the adjacent magnetized body; the rotation of the liquid is confined to the portion traversed by the vertical current.

Under suitable conditions the phenomenon of rotation is definite, conspicuous and strong, and is usually more powerful with a tubular electro magnet than with a voltaic coil alone; a very thin iron tube weakens the effect of the coil, whilst a thick one reverses the motion and makes it stronger. The system of rotations, either with a coil or magnet, is also perfectly symmetrical. The directions of rotation produced by a coil alone are independent of the magnetic nature of the wire of the coil. Like other electro-magnetic effects, the rotations are not prevented by the interposition of metallic screens, provided they are non-magnetic. The rotations may be easily produced by the aid of a current from three or four Grove's elements, especially if permanent bar magnets are used instead of a voltaic coil. The rotations by means of vertical currents in the liquid may be produced by the influence of coils or magnets, either above or below the liquid, as well as around it; with magnets, however, in the former positions, no external reversal points occur. A magnet placed entirely above or below the liquid produces the same directions of rotation as a coil placed either above, below or around it. The direction of rotation produced in a liquid above a coil by an *upward* current in the liquid agrees with that produced by a *radial centripetal* one.

A rotation apparatus of the same kind, interposed as a screen, does not prevent or appear to affect the movements.

Each electrode may be made to separately revolve in the presence of a coil or magnet, by the well-known influence of the radial currents in them; and the directions of rotation are the same with a magnet as with a coil. In this respect the motion produced by radial currents differs from that produced by vertical ones. With each electrode, diverging currents produce dextro and converging ones, lævo rotation. The rotation of the electrodes by means of radial currents appears to be independent of that produced in the liquid by means of vertical ones.

The rotation also of the vessel containing the liquid may be obtained independently of that of the electrodes, by means of the vertical current in the liquid, without the aid of the radial currents in the electrodes.

The rotations produced by a vertical axial current are not confined to liquids, but may also be produced in a solid conductor, and probably therefore with any body conveying an electric current or discharge.

The directions of rotation produced in liquids by means of radial currents under the influence of a magnet or coil, are the same as in the solid electrodes, and are lævo at all positions with centripetal currents and dextro with centrifugal ones, when the North Pole is above.

A given direction of axial current, whether in a solid or liquid conductor, whether above or below a given magnetic pole, and whether that pole constituted the upper or lower end of a coil or magnet, produced the same direction of rotation. A given direction of radial current also, whether in the electrodes or electrolytes, or above or below a given pole, provided that the pole was not altered in position, produced the same direction of rotation.

Various other phenomena, such as temporary reversals of the direction of rotation, successive action of the coil and iron tube, &c., &c., are recorded in the paper.

With a Solenoid.—A current flowing upwards from a south to a north-seeking pole produces dextro rotation at the former, and lævo rotation at the latter. *With a magnet* these two directions are reversed at all distances between the two neutral points near the poles of the magnets, but not beyond. The phenomena therefore of rotation are more complex with a magnet than with a solenoid.

The reversals of direction of rotation which occur when a tubular magnet is employed appear to be due to the inner surface of the magnet and to the position of that surface in relation to the current in the liquid. The direction of rotation and the points of reversal appear to be all independent of each other.

The action of radial currents is more simple than that of axial ones, especially near the poles of a magnet. With radial currents, either in the liquid or electrodes, there is no reversal either at the center of the magnet or coil, or at the poles, or beyond them.

The experiments show in a conspicuous manner the difference of property of the interior surface of a hollow magnet, and of that of a solenoid having the same kind of poles at their corresponding ends. This difference of property is well known, but is illustrated in the paper in a new way experimentally.

The whole of the foregoing results are illustrated by experiments.—*Nature.*

Laws To Protect Submarine Cables.

The subject of protection to marine telegraph lines has at last reached the point when the matter must be considered by nations, separately, if not collectively, as was more than ten years ago proposed by the establishment of an international code of laws applicable to the parties thereto in peace as well as in war, and in effect making the subject a part of the law of nations. In the "Draft Outlines of an International Code," by David Dudley Field, published in New York, in 1872, this subject is fully considered and provided for. By that code the destroying or injuring an ocean telegraph is declared to be piracy, and that submarine telegraphs are within extra territorial jurisdiction of nations, and may be landed on the shores of any nation, and that all persons may correspond by international telegraphs, except that the government may suspend service if it is within its territory, under the obligation to notify such suspension to all other nations uniting in the international code. Submarine telegraph shall be exempt from acts of hostilities in time of war. The suspension of intercourse across belligerents' lines are also provided for.

The possibility of giving some legal protection to submarine cables was carefully considered by the Institut de Droit International. A committee was appointed in 1878 to consider the subject, and the presentation of its report to the meeting at Brussels in 1879 was followed by an interesting discussion (see the "Annuaire de l'Institut," 1879–80, pp. 351–394). The conclusions ultimately adopted by the Institute were as follows :

"1. It would be very useful if the various States would come to an understanding to declare that destruction of or injury to submarine cables in the high seas is an offense under the Law of Nations, and to fix precisely the wrongful character of the acts and the appropriate penalties. With reference to the last-mentioned point, the degree of uniformity attainable must depend on the amount of difference between systems of criminal legislation. The right of arresting offenders, or those presumed to be such, might be given to the public vessels of all nations, under conditions regulated by treaties, but the right to try them should be reserved to the national courts of the vessel arrested.

"2. A submarine telegraphic cable uniting two neutral territories is inviolable. It is desirable that, when telegraphic communication must be interrupted in consequence of war, a belligerent should confine himself to such measures as are absolutely necessary to prevent the cable from being used, and that such measures should be discontinued, or that any damage caused by them should be repaired as soon as the cessation of hostilities may permit."

On another page we print a copy of a memorial which has been presented to Lord Granville on behalf of Ocean Telegraph Companies, setting forth the difficulties they have to contend with when repairing their cables, and asking for some protection in the matter. The subject has been brought prominently before the public lately by a long correspondence in the *London Times*.

What reason the telegraph companies had for only presenting the question for the consideration of the English government and not addressing and requesting in a similar manner the co-operation of all other maritime nations does not appear, but may be conjectured. It is a movement, however, that should be above national jealousy, when the entire civilized world is directly interested in its relations and dispositions.

The *London Times* seems to comprehend the proper way of proceeding to effect the object sought for.

That journal makes some comments on the memorial which are worth producing. It says: "In review of the provocations given," by fishermen and others, "and the extensive damage suffered over and over again, the language of the memorial to Lord Granville is singularly calm and moderate. The companies ask, as they have a right to ask, for protection." As to how they are to be protected, the *Times* continues: "The possible remedies may be divided under two headings. There are those which our own government can enforce, and those which can only come from a general agreement, to which other governments must be parties. Of the first kind are the additions to our own statute law, which would make willful or grossly careless damage to submarine cables a penal offense. But far more important than anything which the English government can do would be the effect of an international arrangement for the legal protection of submarine cables. It is, therefore, much to be desired that the needful protective legislation should be taken up as a common work by all countries. Germany, as an extract from a communication from the Minister of Posts and Telegraphs shows, is bestirring herself with a view to this. England, which has a larger stake than Germany, ought not to be less forward." The article concludes by referring to the question of the lights of telegraph ships and their having to pay harbor dues in Great Britain. The communication from the German Minister of Posts and Telegraphs referred to above, reads as follows: I "have already entered into communication with the proper functionaries of the German Empire with a view to bring about, for submarine cables, the legal protection urgently required in the direction of international provision and the alteration of our internal German penal code" France is also stirring in the matter. It is stated that M. Cochery, the French Minister of Posts and Telegraphs, is preparing a project for the protection of cables which is to be laid before the French Chamber of Deputies at an early date.

The memorial was also presented to the Board of Trade in London, and in their reply, among other suggestions, they say, "There is one observation which applies to all these causes of complaint, and which, in itself, affords a reason why neither the Board of Trade nor any other department of Her Majesty's government, or even the British legislature, can, even if so disposed, afford immediate relief. This is, that in every one of the cases of complaint mentioned in the memorial, foreign nations are concerned as well as ourselves, and we can only proceed with their concurrence."

The extent and importance of submarine cables will more fully appear in the following list of lines, and their length in nautical miles up to January 1st, 1881, as follows:

	Miles.
Anglo American	12,319
Black Sea	403
Brazilian Submarine	4,227
Cuba Submarine	1,068
Direct Spanish	931
Direct United States	3,438
Eastern	18,888
Eastern and South Africa	4,441
Eastern Extension	12,022
German Union	258
Great Western	5,590
Mediterranean Extension	235
Mediterranean and Brazilian	230
Platino-Brazileira	1,219
Submarine	702
West Indian and Panama	4,689
Western and Brazilian	2,901
Total	73,562

During the past year about ten thousand more miles were laid and contracted for, and will probably be completed this year. The Central and South American Telegraph Company commenced laying its cables, which, when completed as contracted for, will exceed 3,082 nautical miles, and the American Telegraph Cable Company has about six thousand miles of new line.

The time is now near at hand when nations must mutually consider and agree together for the uses and protection of submarine telegraphs by treaties or conventions similar in effect to those laws specified in Mr. Field's proposed International Code above mentioned. The sooner proper steps are taken to bring this about the better. The propositions for such a convention would very appropriately come from the United States Government, through the Secretary of State.—*Journal of the Telegraph.*

Lighting of Railway Carriages by Electricity.

The new Pullman car train, under the name of the "Pullman Limited Express," has begun its regular service on the London, Brighton and South Coast line, between the Victoria station and Brighton. Single cars of the American pattern have been running on this line for five or six years, but this train is made up entirely of Pullman cars. These cars, of which there are four, have been constructed at the Derby works of the Pullman Palace Car Company, under the superintendence of Mr. H. S. Roberts, the manager of the company in this country, the fitting up and arrangement of the cars being carried out after the designs of Mr. J. P. Knight, the general manager, and Mr. Stroudley, the locomotive and carriage superintendent of the London, Brighton and South Coast Railway. The train includes a parlor car, a drawing-room car, with ladies boudoir and dressing-room, a restaurant car, and a smoking car, while a compartment at each end of the train next to the luggage compartment is provided for servants. The cars are kept at an equal temperature by means of hot water pipes. There is electric communication between the parlor, drawing-room and smoking cars, and the restaurant car, and in many ways the comfort of passengers is provided for. The most important and novel texture of the new train is, however, that it is lighted throughout by electricity. As the train enters Box-hill and other tunnels on the Dorking, Horsham, and Steyning route, by which the trip to Brighton is made, the cars are simultaneously, and by the mere turn of a handle, brilliantly lighted, and as quickly, when the train emerges, the light is turned off. The trial confirms the results of an experiment made some few weeks ago with a single car, and proves the possibility of satisfactorily lighting a whole train by electricity. The lamps used are Edison's incandescent lamps of which altogether there are 29 distributed in various ways throughout the train, the drawing-room car being sufficiently illuminated with an effect of pleasantly diffused light by five of them. Each lamp is computed to be giving a light equivalent to that of nine or ten candles. As one of these Pullman cars is 58ft. 5in. long, the length of train to be lighted is over 233ft. The electricity is supplied by Faure accumulators, of which 80 are carried. Mr. W. Lachlan, the engineer representing the Société La Force et La Lumière, who was in charge of the batteries at the trial, reported that about 30 were brought into use on the down journey, and only a portion of the electricity stored in these was expended. On the up journey these and four fresh boxes were brought into opera-

tion. For the present the accumulators will be charged each evening at the society's depot at Charing-cross, but as soon as the necessary arrangements can be made it is intended that the recharging shall be done at Victoria with a dynamo machine worked by a small stationary engine. It is not improbable, however, that before long the electricity required may be generated on the train itself, the chief practical difficulty in the way of this saving of force arising from the unavoidable alteration in the speed of the train—a mechanical difficulty in the way of charging the accumulators in this way, which the ingenuity of the electrical engineers will no doubt soon overcome.—*The Inventors' Record.*

Description of the Telephone.

We think the following excellent description of the essential working parts of this wonderful instrument will prove interesting to even those who are quite familiar with it:

The telephone now in general use has a thin diaphragm of iron, japanned for the prevention of rust, and a powerful permanent magnet, with a soft iron core on one end, which is surrounded by a coil of fine insulated wire. The diaphragm is clamped at its edges between two surfaces of hard rubber, and is placed as near the soft iron core as it can be without coming into atcual contact when vibrated by the voice. The diaphragm, coil and magnet are enclosed in a case of a convenient shape, with an aperture opposite the diaphragm to transmit and receive the voice. Both ends of the coil terminate in binding screws, by means of which the conducting wires are connected.

OPERATION OF THE TELEPHONE.

When the telephone is spoken into, the diaphragm is caused to vibrate; as it vibrates it approaches and recedes from the permanent magnet, and produces electric currents in the coil, which flow along the conducting wire, and passing through the coil of the telephone, at the other end of the wire, cause its diaphragm to vibrate in precisely the same manner, and to reproduce the same sounds.

BATTERY TRANSMITTERS.

The practical use of the telephone created a demand for a more sensitive instrument, capable of producing louder sounds. This was accomplished by the invention of the battery transmitter.

This instrument, as its name indicates, is used for transmitting the voice in connection with the telephone, which is used for hearing. It has a diaphragm of iron (similar to that in the telephone), pressing against two contact points which are in circuit with a galvanic battery and induction coil. These contact points are made either of carbon or platinum. Its operation is similar to that of the telephone, but the current of electricity which it uses is supplied by a galvanic battery, whereas in the telephone it is created by the vibration of the diaphragm in front of the permanent magnet.

USES OF THE TELEPHONE.

It would be difficult to give in detail the variety of service which can be accomplished by means of this ingenious instrument. Its value in economy of time and labor is demonstrated daily. It is capable of rendering perfectly satisfactory service in establishing communication between persons separated by long or short distances. Its merit is best attested by the large number which are now in use, and the constantly increasing demand for them, not only in the United States, but all over the world.

The American Bell Telephone Co. controls for the United States the fundamental patents on telephones issued to Alexander Graham Bell; also, the patents of Thomas A. Edison, Elisha Gray, G. M. Phelps, Francis Blake, Emile Berliner, Thomas A. Watson, George Lee Anders, and many others.

The *Electrician* very tersely remarks that "the invention of the telephone and the microphone—the telescope and the microscope of the world of sound—though but of yesterday, have already left far behind the astonishment and romantic sensibility which greeted them. The one has entered and become a routine part of the every-day business necessity; the human voice making itself heard from afar at every commercial center, and extending itself at will to any point on its circumference. The other, already the familiar friend of science, is reporting the hitherto unheard voices of nature to ears who are learning its various language."

Time for Men to Fly.

AN INVENTOR'S NOTION OF WHAT MAY BE DONE WITH ELECTRICITY'S HELP.

"There is no question about it," said Mr. Crandall, the inventor, as he sat in his mechanical study in Brooklyn, at work upon something new. "A flying machine can be constructed, and as soon as I get to my mark in money-making I am going to construct one. I am sure I can do it. Of course the bird is the model, just as the fish is the model for a boat. My notion is to make a body, egg shaped, out of raw hide, drawn over a model and formed when wet, and to suspend it between two large wings of papier mache. These wings, of course, will be made like a bird's. It has often puzzled me to know how a bird, after making its first leap from the ground, mounted higher and higher. I have, I am sure, discovered the mechanical method, and I provide for it by filling the wings with holes, and covering the holes on the under side with thin shutters made of light paper and opening downward, so that when the wings are raised against the air they will be sieves, and the resistance of the air will be lessened, and when they are lowered they will beat solidly against the air. These wings I should have made upon a frame, working in a socket with a ball joint where they touch the boat. Now, a bird's body hangs below its wings when it flies. So should the boat of a flying machine. A bird can turn its wings almost at any angle. The man in my flying machine can do the same thing by pressing upon pedals in the bottom of his boat. He can thus have perfect control of his course, and can shape it to any point of the compass."

"What would be your motive power?"

"Electricity. I would run the wings by an electric engine, operating a crank in the middle of the boat. I calculate that the raw hide boat would not weigh over ten pounds, and that the electric engine would be of about the same weight. The wings would be about fifteen feet long, and the speed of the machine would depend upon the velocity with which these wings may be worked. See what a weight in body the gossamer threads of a humming bird carry, or the wings of a bumble bee. Yet they fly at great speed because they move their wings with great rapidity. I think that with batteries of bottled electricity and the tiny electric engines of great power the flying machine is taken out of the category of dreams, and appeals to the inventive faculties of practical men.

"I believe that before another century is gone by men may have flying machines on their housetops in Brooklyn, that they can take a seat in them, turn a tiny switch, and put their feet upon their pedals, unfold a morning paper, and cross over to New York with as little concern as they can feel in a ferryboat, or as they may some time, sooner or later, feel on the bridge. The plan is simple, and, as I am not ready yet to begin it, I hope some other inventor will take it up."—*The Sun.*

The New Suspension Bridge.

At the February meeting of the Board of Trustees of the East River Bridge yesterday, the financial statement showed that $13,538,947.05 had been so far received by the trustees, and that $13,439,490.56 had been expended, leaving $99,356.49 on hand in cash. The present liabilities are $101,353.45.

The Executive Committee reported in favor of substituting spruce for oak in flooring the roadway. Mr. Stranahan said that the change would reduce the weight of the superstructure 130 tons. He added that spruce had been used on the bridges of the ferries, and had lasted well. Gen. Slocum did not believe that there was a bridge in the city on which spruce was used, and he opposed the change. Mr. McDonald said that as an engineer he believed that spruce was suitable.

W. C. Kingsley said that Engineer Roebling's request to substitute spruce for oak seemed to indicate that he had suddenly become a convert to the use of spruce. It was singular that he should reach this conclusion a year after the contract for oak had been made. The matter was referred to the Committee on Transit.

The Committee on Transit over the Bridge, which for a year has been considering the subject, recommended rope-traction power and circulating cars with elevated platforms at the ends of the bridge. The platforms are to extend 600 feet from the ends of the bridge, and are to terminate on a level with the elevated railroads. It was claimed that this plan would relieve the approaches to the bridge from a great deal of crowding from persons and vehicles desiring to cross. The cars are to pass around on an endless track.

Attached to the report of the committee was the Chief Engineer's opinion, approving of the circulating system, and the plans of the elevated platforms. This plan, he says, will not interfere with the traffic on the roadways, and would readily allow for connection with elevated rapid transit systems. He estimates that the cost of the platforms will be $268,980 and that the cost of the engines, boilers, ropes, sheaves, foundations and machinery will be about $73,439. The boiler house and machine shops will cost about $12,000, and the rolling stock, including twenty-four cars costing $4,125 each, will cost $99,000. Including an estimate for contingencies, the whole cost would be about $500,000. As an additional appropriation is needed to provide for this railway system, the report was laid upon the table. Gen. Barnes said that in November last the Chief Engineer's estimate of the cost of the track, cars, rolling stock, &c., was $264,000. Now it was $500,000, and upon his motion, seconded by Mayor Low, the Engineer was called upon to explain the discrepancy between those two estimates.

Gen. Barnes offered a resolution providing for a temporary foot bridge over the floor beams, so that the bridge could be thrown open to the public. Messrs. Kingsley and Murphy said that this was impracticable. Mr. Stranahan said that Engineer Roebling favored the opening of the bridge to pedestrians as soon as it could be done with safety, and that probably the bridge would be ready for such use before it was completed. No action was taken.

It is said that the President of the French Republic experienced so much pleasure in hearing the voices of the performers at the opera through the telephone that he has caused similar communication to be established in the Palace of the Elysée. The Opera House, the Theatre Français, and the Odéon Theatre have been connected with the president's apartments, where a series of "telephonic" soirées were recently held.

Telegraphic and Telephonic Notes.

In London no less than 700 female clerks are employed at the central telegraph station at St. Martin's-le-Grand; while at the other metropolitan post and telegraph offices there are some 150 more, making a total of 1,200 women employed in the post and telegraph offices of the metropolis alone, without counting the very large number engaged throughout the country.

Since the recent decision in France to employ, generally, underground wires, the price of gutta percha insulated wire in that country has risen 35 per cent.

The influence of the development of the network of telegraph wires, and of the lowering of charges in private telegrams in France since 1851 is well shown in the following table:

	Telegrams.
1851	9,014
1859	4,022,800
1869	10,367,086
1879	14,283,347

In Egypt there are only 15 letters to one telegram; in Norway, 17; Roumania, 19; in France there are 34; in Germany, 49; Great Britain, 46; Austria and Spain, each 57.

The Iceland cable passes by the Faroe Islands, Danish Archipelago, to the north of Scotland, near Thurso, in Caithness County.

The expense of laying this new submarine cable between the great Arctic island and north Scotland has been placed at 250,000 pounds sterling.

The Mexican Telegraph Company are laying a cable from Brownsville to Galveston, Texas.

Returns from the test offices of the Western Union Telegraph Company for the week ending Jan. 21 show an increase of $41,358 over the corresponding week of 1881. These returns represent as nearly as possible half the receipts from all the offices.

The Mutual Union now has an office in the Boston Stock Exchange, whence it works direct with the New York Stock Exchange.

The Bankers & Merchants' Telegraph Company opened an office in the Stock Exchange, Jan. 16, with Captain J. R. Dennis, late of the Pacific Coast, in charge, assisted by Messrs. Heston, Buchanan, Forbes, Sylas and Montreath. The office already does a very good business, three duplexes being worked with Philadelphia. The principal office of the company is at 26 Broad street. A number of additional branch offices in this city and Philadelphia will be open in a few days.

The tenth and last installment of 10 per cent. on the subscription to the construction fund of the Mutual Union Telegraph Company has been called, and is payable on or before Feb. 15, at the office of George Wm. Ballou & Co., 16 Wall street.

The Canada Mutual Telegraph Company has uninterrupted communication between Montreal, Toronto, Buffalo and New York city, and will connect with Ottawa on the opening of Parliament on the 9th inst.

A recent lamentable accident on a London railway suggests the use of a telephone in each signal box as supplementary means of communication in addition to the ordinary telegraph instruments.

The telephone has penetrated even to Russian Turkestan, as we learn that Samarkand is in telephonic communication with Katty Kourgan, forty-four miles distant.

The electric boat, in which it is proposed to cross the Channel between Boulogne and Folkestone, is almost ready, and is only awaiting its electric motors.

A Curious Cause of Faults in Telegraphic Lines.

One of the greatest obstacles to telegraphers in Japan is caused by faults occasioned by spiders.

The trees along the lines are filled with these insects, which spin their webs between the earth, the wires, the posts, the insulators and the trees.

When these webs become wet with dew they constitute a good conductor, and the lines are found to be in connection with the earth.

The only method of obviating this inconvenience is by employing brooms of bamboo to brush away the webs. But, as the spiders are more active than the workmen employed in this work, the difficutly is not the less serious.

Several editorial articles in course of preparation are unavoidably omitted from this issue on account of the rush of other business and limited time. Our next issue will be more elaborate and satisfactory in every particular.

Edison's Electric Road.

The heavy snows of the past week have seriously interfered with the work upon Edison's new Electric Railway at Menlo Park. This is expected to reach completion in about two months. Its length will be about three miles, running from Menlo Park toward Plainfield. At present only a mile has been finished. While the old road, which was only three-quarters of a mile in length, presented peculiar difficulties from its high grades and sharp curves, the new road is comparatively level in order that Mr. Edison's experiments on the speed and traction power of his electric motor may be undertaken under more favorable circumstances. The gauge of the new road is peculiar, being three feet six inches, neither the usual narrow nor broad gauge, and it is a few inches less than the gauge of the old road.

The motor used on the old road was a rough, open affair resembling a large hand-car, and containing simply the dynamo-electric machine, with the shafts, pulleys and belting for communicating the power to the driving wheel. To replace this there has just been constructed at the Edison Machine Works, in this city, an electric locomotive engine, built to resemble the ordinary engine as closely as possible, and designed especially to run at a high rate of speed as a passenger engine. Another and heavier locomotive engine is being built, which is intended for freight purposes. A passenger car has also been constructed for this railway by the Stephenson Car Company. Perhaps the most interesting feature thus far is the new locomotive. The "plant" of the railway at Menlo Park will, when completed, differ little from the old road. Dynamo-electric machines in the central station will send a steady current of electricity through the iron rails of the road. Where two rails join, strips of copper at the sides make the connection perfect. When this system is tried upon a long railway Mr. Edison intends to place stations at intervals of ten miles, from which the electric current will be sent through the rails for five miles in either direction. But the new locomotive engine which is run upon these rails, is a curiosity. It resembles the ordinary engine in having a cab, what appears to be a short boiler, and one pair of driving wheels. It differs most noticeably from the steam locomotive in having no smokestack, and being much reduced in length.

Its height to the top of the cab is nine feet, and its length fifteen feet. To understand its construction, it must be remembered that the leading point on which the experiments are based is, roughly stated, that a dynamo-electric machine will absorb and store up, as well as develop electric energy, acting as a store house as well as a factor of power. The force developed in the machines at the central station is transmitted through the rails to the driving wheels of the engine, thence by wires and attachments to another dynamo-electric machine in the engine, and thence by belting-in the old and by gearing in the new engine, to a shaft, and thence back to the driving wheel, causing its revolutions. In the new locomotive the electric machine is in the very front of what takes the place of the boiler, just behind the cow-catcher and above the driving wheels. The shaft, on which are pulleys, operated by gearing from the electric machine, and in turn causing to revolve pulleys upon the shaft of the driving wheel, is placed nearly underneath the cab, at the opposite end of the engine from the electric machine.

The rim of the driving wheel is partly separated from the center by a groove for purposes of insulation, but the two are bound together by three clamps made of some composition. The current passing from the rail to the rim of the driving wheel, passes through these clamps to the hub of the wheel. Touching the hub is a copper brush at the end of a horizontal rod looking not unlike the connecting rod of an ordinary engine. Through this copper brush the current passes from the hub, and is conveyed by short wires, or cables, to the armatures of the dynamo-electric machine. As these become charged the bobbin of the machine rapidly revolves. On the same shaft with the bobbin is a pulley from which gearing runs back to a pulley on the shaft under the cab. From another pulley on this shaft, gearing runs to a pulley upon the shaft of the driving wheels where the power is applied. Of course, in the main, the methods as described are those employed in the old motor. In appearance, however, the two have no resemblance. And, while a speed of forty-two miles an hour was estimated to have been attained with the old motor upon the old road, Mr. Edison hopes readily to surpass this speed with the new locomotive. When the three miles of track at Menlo Park are completed some time will be spent in experiments and tests which will very likely result in some changes, but Mr. Edison is confident that electricity will before long be adopted as a motive power upon elevated roads and roads where it is important to avoid smoke and sparks, if not used universally. He rests his faith upon the greater economy of the electric locomotive. With the new dynamo-electric machine he believes that 95 per cent. of the power developed will be converted into electrical energy, and 91 8-10 per cent. will be available. If the loss from leakage is 10 per cent., this leaves 82 6-10 per cent. available on the line. The ratio of mean economy for the electric, as compared with the ordinary locomotive engine, is stated to be 4 to 8.93, or 52 2-3 per cent. in favor of the electric lo comotive

American Institute Election.

There was no end of excitement in the corridor of the Cooper Union Building yesterday, where the members of the American Institute lobbied for votes. It was the occasion of the annual election. There was a regular ticket, with the officers of the party in power on it for re-election, and a members' ticket representing the dissenting element. Four hundred and seventy-seven votes were cast, of which 241 were for the regulars. This makes the following the officers for the next term:

President—Nathan C. Ely. Trustees—Charles H. Clayton, Vice-President for the year; James Delamater, Vice-President for the year; Edward Schell and William H. Schermerhorn. Managers—Alexander M. Egleson, George Whitfield, Abraham Lent, William H. Gedney, Charles F. Allen, John J.

Tucker, John Jardine, Albro Howell, Augustus Wetmore, Jr., J. Trumbull Smith, Edwin R. McCarty, Benjamin R. Western, Peter W. Mead, Aaron L. Northrop, and John H. Walker. Auditors—Wm. A. Camp, for the term of three years, and James G. Powers, for the unexpired term of Seymour A. Bunce, deceased. Inspectors of Election—Benton H. Martin, Joseph E. Dunham, and Thomas B. Briggs.

Production of Precious Metals.

Mr. J. J. Valentine's tables on the production of the precious metals in the States and Territories west of the Missouri River, printed elsewhere in this issue, are full of interest, and are eloquent proofs of the important movements which have taken place during the year in the relative position of various States and Territories as producers. Colorado, which leads the list with nearly $23,000,000, is credited with a gain of $1,672,171 during the year, while Nevada shows a falling off of $3,184,057. This, of course, is principally due to the failure of the Comstock lode, which during the year turned out only $1,726,162, against a yield of $4,639,025 in 1880. The Eureka District, too, declined a little, receding from $4,639,025 in 1880 to $4,127,265 in 1881. Utah is credited with an increase of $860,335; while California has pretty nearly held its own, with a gain of $323,582 in silver, and a loss of $579,069 in gold, which is less than the troubles incident to the debris agitation might lead one to expect. Arizona stands fourth as the one which has added the greatest increase to its production, it having been $3,726,295.—*Engineering and Mining Journal*.

A New American Seaport Projected.

A bold attempt to develop a new Atlantic seaport is being made in the neighborhood of the historic village of Newport News, on Hampton Roads, at the mouth of James River, Virginia. A combination of prominent railroad men and capitalists have purchased the entire water front for about eight miles, and back from the shore about four miles. Streets for a new city have been laid out, and a large force of men are employed in constructing wharves, railway stations, warehouses, and other requisites for the terminus of a vast railway system, embracing important central, southern and Western connections.

Describing the work projected and in progress by the two companies interested in this scheme—the Chesapeake and Ohio Railroad Company and the Old Dominion Land Company—a correspondent of the *Herald* sketches as follows the operation at Newport News:

"Surveys have been made and streets have been laid out. The cross streets are numbered up among the thirties, and this fact may serve as an index to the great expectations of the projectors. The point has a rounded outline, with a beautiful beach, over which the water ripples without a stain. The sand is yellow and rather coarse. Only a dozen yards from the shore the natural depth is sufficient for vessels of 1,000 tons burden, and it increases rapidly in advancing toward mid-channel. The opposite shores are handsome. The width of the James here seems over two miles. On the left lie the Hampton Roads, Newport News being their upper limit. The Newport News Creek here disembogues. It is a small estuary, capable of floating sloops, barges and canal boats.

"An immense work is progressing at Newport News, about five hundred men being employed besides those who are building the railroad. About the apex of the point, so to speak, is constructing an immense wharf, which is to serve as the freight and passenger depot. It is 700 feet long and 132 feet wide, and is larger than any one in New York Harbor. It is solidly built, and has already cost about $800,000. It is yet to be covered with a warehouse, waiting rooms and ticket offices. A coal wharf, 55 feet wide and 700 feet long, is also in course of construction. It is situated about two hundred yards north of the main pier. The Old Dominion Steamship Company has obtained the privilege of constructing a wharf for its use, which will be about 80 feet wide and 700 feet long, and will be covered with warehouses. A grain pier, equipped with an elevator as large as the great Erie elevator in Jersey City, with a capacity of 1,500,000 bushels of grain; a lumber pier, 100 feet by 700 feet, and a second coal pier, 55 feet by 700 feet, are soon to be commenced. The bulkhead that is now contemplated will extend along the James River for half a mile. The distance from pier to pier will be about 250 feet, thus forming basins 700 feet by 250 feet, in which vessels can be moored while unloading.

"The shore of Newport News rises abruptly from the beach in a small bluff about twenty-five feet high, beyond which lies a broad and level plateau, the elevation of which gradually increases toward the east until it attains about forty feet. The only inequalities are caused by small water courses, which can quickly be filled up. The inclination from the rear of the proposed city to the shore will be very palpable, yet extremely gentle, and the drainage will be perfect. The bluff near the water will be 'graded down,' and along the shore there will be laid out a broad street, where most of the future business is likely to be transacted. A small temporary hotel, a store, machine and carpenter shops, and a few laborers' huts are the only new buildings so far. The area of the city, so far as planned, will accommodate about ten thousand people. Industrial works, it is said, are to be erected by the land or railroad company, which will give employment to about 2,500 men. Among these projects is that of a number of iron furnaces, where the ore from the mines owned by the company will be treated. Their employees are to be given a chance to purchase small lots of land for their homes, and money for this purpose will be advanced to them by interested capitalists.

"The advantages of Newport News for a seaport are very great. Hampton Roads, on which it is situated, is one of the finest harbors in the world, and the only one in the United States which can be safely entered without a pilot. There is no bar at the entrance of Chesapeake Bay, and a dozen navies could ride there abreast. The News is but fifteen miles from the open sea, while New York is twenty, Boston about fifty, Philadelphia one hundred, and Baltimore one hundred and sixty. The Roads are never frozen over nor filled with broken ice, and the water close to the shore will float the largest vessel ever built.

"There are twenty eight feet of water at low tide at the wharves, so that vessels may approach them under sail at any hour of day or night."

Electrical Sheep Shears.

Mr. Edison has referred to us a communication from New Zealand in which the writer sets forth at length the pressing need of some means of shearing sheep evenly, rapidly, and without risk of hurting the animal. Sheep raising, it will be remembered, is most largely carried on in sparsely inhabited districts where skillful shearers are hard to get.

The writer appeals to Mr. Edison, thinking that an electrical apparatus might be made to answer, the cutting to be done by means of a wire highly heated by an electric current. The length of the heated wire or cutter would have to be about three inches.

The use of an incandescent wire of platinum for cutting has been entirely successful in surgery, in removing tumors and other diseased or morbid growths, and there is a possibility that it might answer for cutting wool. Whether the heated wire would injure the wool, or whether the accumulation of ash would speedily make the cutter inoperative, are questions which trial alone can decide.

Some years ago patents were taken out for a method of felling timber by the use of wire electrically heated, but when the method was put to practical test it failed, as the ash of the burnt wood soon surrounded the wire with a fireproof shield.

Whether a similar difficulty would arise from the coating of the wire with wool ash and charred wool on applying the method to wool cutting, and whether this or other possible difficulties can be easily overcome in an electrical shearer, can be determined only by trial.—*Scientific American*.

The Electric Exhibition at the Crystal Palace.

Some time before the closing of the Electric Exhibition at Paris the managers of the Crystal Palace decided to have one at Sydenham. This scheme met with a good deal of opposition at first. It was maintained that at least one or two years should elapse before anything of the kind was attempted, and it was further prophesied that exhibitors would not be willing to undertake the trouble or go to the expense of another exhibition following directly on that at Paris. However, defenders of the scheme were not wanting, who put forward the view that, as the exhibition at the Palais de l'Industrie had its main interest in the more modern practical appliances of electricity, another similar display in England would be of interest and value to many whose knowledge of the science, and whose interest in the subject, had not been great enough to induce them to undertake a journey to Paris last autumn. As to the objection due to the unwillingness of exhibitors, at first it appeared as if it had no foundation in fact, for within a very few weeks so many applications had been made that the whole of the vast space at the disposal of the managers of the exhibition had been allotted, but then for many weeks there was cause for some fear that the exhibition would not take place. Time went on, but no exhibits arrived, and there seemed to be no activity on the part of the exhibitors. No doubt the fact that the Paris Exhibition was kept open much later than had been expected had much to do with the delay. However, just after Christmas the Postal Department, the British Electric Light and Power Generator Company, and Mr. Edison's representatives had advanced so far in their work as to inspire a feeling of rivalry, and now the exhibition is rapidly advancing towards completion.—*London Saturday Review*.

The Value of a Knee-Pan and an Eye.

Amelia Langley recovered yesterday, in the Superior Court before Judge Russell, a verdict for $6,000 against the Sixth Avenue Railway Company. Miss Langley in October, 1881, was riding as a passenger in one of the defendant's cars. She told the conductor of the car she wanted to get out at Ninth st. When the car arrived at Ninth st., the conductor neglected to signal to the driver to stop, and she rose and called to the conductor He rang the bell and the car was stopped with such a sudden jerk that she was thrown over the legs of a passenger, who was seated, in a sprawling posture, and fell heavily against the floor of the car. The conductor helped her to get up and to get off the car. She reached the sidewalk with difficulty. In attempting to step from the street to the sidewalk she fell down. She asked a passer-by to assist her into a neighboring apothecary's shop, but he said he was too busy. The next man either had less business or more humanity, and assisted her into the shop. Upon examination it was found that she had broken her knee-pan. She brought an action against the company to recover $15,000 as damages.

Ex-Judge Fithian appeared as counsel for Miss Langley, and D. M. Porter for the company.

William H. Popham not long ago was injured in one of the cars of the Sixth Avenue Railway Company, which was run into by a car of the Twenty-third Street Line. The window-pane at his back was shattered and a piece of glass was thrown into his right eye, which had to be removed. He began an action in the Superior Court to recover $50,000 damages against both the railway companies, the trial of which was concluded yesterday. The jury brought in a verdict in his favor for $10,500 against the Twenty-third Street Line. Charles E. Crowell and Chauncey Shaffer appeared for Mr. Popham, and O. E. Bright for the companies.

NEW PATENTS—1882.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JANUARY 10, 1882.

No.

Electric Cable, W. J. Philips.....252,249
Electrical Illumination, C. E. Buell.....252,178
Electrical Signal Transmitter, G. S. Mott.....252,242
Electrical Signaling Apparatus, C. E. Buel and J. F. Buel.....252,258
Electro-Magnetic Brake, L. W. Goss and H. Walter.....252,288
Insulated Electrical Conductor, W. H. Sawyer.....252,261, 252,262
Electric Lamp, A. G. Holcombe.....252,219
Electric Lamp, R. M. Hunter.....252,037
Electric Lamp, R. R. Moffatt and S. Chichester.....252,125
Electrical Lamp, A. B. J. Cance.....252,182
Telephone, E. T. Greenfield.....252,294
Telephone, J. H. Rogers.....252,255, 252,256
Telephone, compound, T. A. Watson.....252,160
Telephone, electric speaking, Rose & Cheever.252,142
Telephone exchange circuit, C. W. Ross.....252,259
Telephone, mechanical, G. K. & H. C. Farrington.....252,024
Telephone transmitter, J. Olmsted.....252,132
Telephone transmitters, carbon of, Scribner & Clarke.....252,296
Telephonic apparatus and circuit, J. H. Rogers.....252,257
Telephony, electric, A. W. Rose.....252,141

JANUARY 17TH, 1882.

Electric Lights, circuit-regulating device, C. M. Ball.....252,347
Electric Machine, Dynamo, C. A. Hussey....252,380
Electric Machines, Commutator for dynamo, A. G. Waterhouse.....252,405
Electric Signal Printing Register, automatic, F. B. Wood and H. J. Brower.....252,409
Electric Signal Apparatus, Brower and Wood.....252,353
Electrical Switch Board, J. B. Odell.....252,395
Electric Lamp, M. G. Farmer.....252,364
Electric Lamp, H. S. Maxim.....252,391, 252,492
Electric Lamp, J. Olmstead.....252,396, 252,397
Carbon Holder for Electric Lamp, A. G. Waterhouse.....252,404
Electric Railway Signal, C. D. Tisdale.....252,545
" " " D. B. H. Lebanc and E. V. A. Loiseau.....252,387
Telegraphic Sounder, G. S. Mott....252,497, 252,498
Telephone, T. A. Edison.....252,442
Telephone, electric, J. H. Rogers.....252,521
Telephone Exchange Switch, H. W. Breckenridge.....252,421
Multiple Switch Board for Telephone Exchanges, L. B. Firman.....252,576
Electric Call for Telephones, W. C. Lockwood.....252,322

JANUARY 24TH, 1882.

Electric Cable, R. S. Waring.....252,634
Electric Lighting Apparatus, M. G. Farmer..252,748
Electric Lighting System, M. G. Farmer.....252,836
Short Circuit Switch for Dynamo Electric Machine, W. Hockhausen.....252,663
Polarity Protector for Dynamo, W. Hockhausen.....252,665
Electric Signal Apparatus, H. Pickford and H. F. Gregory.....252,797
Insulator for Telegraph wires, C. L. Gore....252,857
Electric Lamp and Generator Combined, E. Morey.....252,691
Electric Lamp, H. S. Maxim.....252,840
Magneto Electric Machine, W. Hochhausen..252,664
Telegraphic Cables, H. A. Clark.....252,739
Telegraphic Signal Boxes, automatic time recorder for, H. W. Pope.....252,798
Compound Telephone, G. L. Anders.....252,641
Telephone Transmitter, S. H Bartlett and S. H. Waite.....252,714

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Electric Lighting Apparatus, J. B. Fuller....253,032
Electric Lamp, J. B. Fuller.....253,033
Electric Lamp, H. B. Sheridan.....254,116
Lightning Arrester, T. Ahearn.....252,859
Duplex Telegraph, C. L. Buckingham.....252,963
Duplex Telegraph, H. Van Hovenburgh.....253,134
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District Telegraph System, C. F. McCulloch..253,080
Telephone Exchange Apparatus, G. L. Anders.....252,986

New Patents—1882.—Great Britain.

The following is a list of patents granted in England on electrical appliances, from January 1st to 10th, 1882:

14. "Apparatus used for electric lighting." A. Mackie. Dated Jan. 2.

29. "Secondary batteries." D. G. Fitzgerald, C. H. W. Biggs and W. W. Beaumont." Dated Jan. 3.

49 "Improvements in measuring and recording quantity of electricity, and in the means or apparatus employed therefor." J. Hopkinson. Dated Jan. 4.

55. "Distribution of electrical energy." J. Perry. Dated Jan. 5.

64. "Magneto and dynamo-electric machines." L. A. Groth. (Communicated by R. J. Gulcher.) Dated Jan. 5.

69. "Manufacture of incandescent lamps." E. H. T. Liveing and C. O. Boys. Dated Jan. 6.

71. "An improved system of automatic electric printing registers and return signals and apparatus therefor." A. J. Boult. (Communicated by B. E. Valentine.) Dated Jan. 6.

72. "Secondary or reversible electric batteries." R. Kennedy. Dated Jan. 6.

84. "Dynamo electric machines." W. R. Lake. (Communicated by E. E. Ball.) Dated Jan. 6.

85. "Machines and apparatus for generating and utilizing electricity for lighting, heating or other purposes. W. R. Lake. (Communicated by J. S Williams.) Dated Jan. 6.

95. "Electric lamps." W. J. Mackenzie. Dated Jan. 7.

118. "Telegraphy." P. Jensen. (Communicated by F. W. Jones.) Dated Jan. 9.

120. "Improvements in the means of, and in the apparatus for, storing electrical energy, and in the preparing of the materials to be employed." J. E. Liardet and T. Donnithorne. Dated Jan. 9.

General E. W. Leavenworth, of Syracuse, has just given $10,000 to Hamilton College for the foundation of a scholarship.

Business Specials.

One of the foremost in the field of electric supplies stands the old-time and always reliable firm of L. G. Tillotson & Co. This firm is just now making a specialty of fine tools for every description of building and repair work, and keep in stock a large assortment of those articles not usually to be found in telegraph and telephone supply houses. Especially noticeable among these are their "pocket sets" of all varieties of tools, including improved screw-cutting tools, inspectors tools and screw drivers, large and small, ratchet and watchmakers', of a dozen different styles and patterns. If any of our friends are in need of articles in the tool line which they can find nowhere else, we advise them to step into Five and Seven Dey Street, and make their wants known. Persons unacquainted with the infinite multitude of articles required in these modern times, for the complete equipment of a standard electric supply house, will find Messrs. Tillotson & Co.'s catalogue an unique work of art, a study and an educational list, reflecting with perfect fidelity the present kaleidoscopic demand in the thousand branches of usefulness of that subtle and powerful agent, Electricity.

In 1879, the Connolly Brothers and McTighe, of Washington, Philadelphia, and Pittsburg, jointly invented and patented a switch, by means of which two subscribers upon separate wires can place themselves in instant communication without calling up a central station, as the apparatus at the central station is so constructed and arranged that by most simple devices at the subscriber's station, any subscriber can place his station in connection with that of a desired subscriber on any other wire, with a precision and promptness that would make the average exchange operator blush. A system—with an automatic exchange of twenty-five wires—built at Philadelphia, is being operated with the most satisfying results.

The principle involved in the operation of this invention is somewhat similar to that upon which the stock printing apparatus works, and is no more liable to displacement and confusion than the stock-printing instrument, which is so common in every public resort in New York and other large cities, where it may be seen ticking off the prices of stocks and other news wholly without attendance, and with a certainty and speed that is marvelous.

Messrs. Clark, Muirhead & Co. have also entered into arrangements with the Eastern Electric Light and Power Company for the manufacture of the "Brush" machine and lamp, and the "Lane Fox" incandescent lamp, for use in India and elsewhere, and has also made for the British Electric Light Company a considerable number of "Gramme" machines and "Brockie" lamps. Considerable business has been done with the telephonic apparatus of the Western Electric Manufacturing Company of New York and Chicago, for whom this firm are the sole European agents. "Howell's patent batteries," which have been so favorably reported on by Mr. C. Hockin, the well-known electrician and engineer, have been largely made by the firm for various railway and submarine telegraph companies.

When purchasing supplies of our advertisers we shall be obliged if you will kindly mention that you saw their advertisement in this paper.

Very important developments are likely to take place in Western Union soon The earnings of the company showed an increase last week of about $80,000.

The new Metropolitan Casino is to have an electrical lighting apparatus like that used in D'Olyly Carte's Savoy Theatre, London. It has been ordered by Mr. Aronson.

The Chemistry of the Plante and Faure Accumulators.

PART I.—*Local Action.*

Among the important discoveries of late years, few have claimed so much attention, or have been so full of promise for practical use, as the accumulator of Planté and its modifications Our attention was very naturally directed to the chemical changes that take place in these batteries, especially as it appeared to us that there must be certain analogies between them and some actions which we had previously investigated. In the present communication we propose to treat merely of one point – that of local action—leaving the fuller discussion of the subject to some future occasion.

It is well known that metallic zinc will not decompose water even at 100° C., but we found that zinc, on which copper had been deposited in a spongy condition, was capable of splitting up the molecule even at the ordinary temperature, oxide of zinc being formed and hydrogen liberated. If placed in dilute sulphuric acid, it started a very violent chemical action, sulphate of zinc and hydrogen gas being the result. We termed the two metals thus conjoined, the *copper-zinc couple*, and this agent was fruitful in our hands in bringing about other chemical changes which neither metal singly would effect. Electricians will readily understand the nature of this agent, and will recognize in its effects only a magnified form of what we are all familiar with under the name of *local action*. Now, the negative plate of a Planté secondary battery is a sheet of lead, upon which finely divided peroxide of lead is distributed. It is well known that the electromotive force of lead and lead peroxide in dilute sulphuric acid is nearly three times that of zinc and copper in the same liquid. We were therefore induced to think that the plate must act in the same way as our copper-zinc couple. We found such to be the case. If a plate so prepared be immersed in pure water, the decomposition of the liquid manifests itself by the reduction of the puce-colored peroxide to the yellow monoxide. There could be little doubt therefore that the lead peroxide couple, if we may call it so, would decompose sulphuric acid, with the production of sulphate of lead. This also was found to be the case.

As the destruction of peroxide of lead means so much diminution of the amount of electric energy, it became interesting to obtain some definite knowledge as to the rapidity or extent of this action.

When the peroxide of lead on the metal is very small in quantity, its transformation into the white sulphate goes on perceptibly to the eye, but when the coating is thicker, the time required is, as might be expected, too long for this kind of observation. In one experiment, following the procedure of Planté, we formed the peroxide on the plate by a series of seventeen charges and discharges, or reversals, each operation lasting twenty minutes, and the time was further broken up by seven periods of repose, averaging about twenty-four hours in length. After the last charge we watched the local action taking place, and found that the whole of the peroxide passed into white sulphate within seventeen hours. In another experiment the two plates formed according to Planté's method were immediately joined up with the galvanometer, and deflection noted. They were then at once disconnected. After the repose of one hour they were joined up again, and another observation taken with the galvanometer. This was repeated several times, with the following results:—

Initial strength of current	100
After 1 hour's repose	97
" 2 " "	40
" 4 " "	14
" 17 " "	1.5

It results from this that during each of the long periods of repose recommended by Planté the peroxide on the lead plate is wholly, or almost wholly, destroyed by local action, with the formation of a proportionate amount of sulphate. But this is not, as it would seem at first sight, a useless procedure; for, in the next stage, the sulphate is reduced by electrolytic hydrogen, and by a process which we hope to explain when discussing the complete history of the reaction, the amount of finely divided lead capable of being peroxidized is increased. That this is actually the case is shown by the following experiment. The peroxide formed on a lead plate by first charging was determined and called unity; it was allowed to remain in a state of repose for eighteen hours, charged a second time, the peroxide again determined, and so on:

Separate Periods of Repose.	Charge.	Amount of Peroxide.
—	First	1.0
18 hours.	Second	1.57
2 days	Third	1.71
4 "	Fourth	2.14
2 "	Fifth	2.43

In other trials, following the procedure of Fauré, we employed plates in which the peroxide was formed by the reduction of a layer of red lead (containing 51 grains to one square inch of metallic surface), and subsequently completely peroxidizing the spongy metal so produced. In one series of experiments we left the peroxidized plates to themselves for various periods, and determined the amount of sulphate formed. This gave us the amount of peroxide consumed.

Experiment I.	after 2 hours	7.2	per cent.	
" II.	" 3	" 15.1	"	
" III.	" 4	" 19.8	"	
" IV.	" 5	" 30.0	"	
" V.	" 24	" 36.3	"	
" VI.	" 7 days	58.3	"	
" VII.	" 11	" 67.3	"	
" VIII.	" 12	" 74.3	"	

The last experiment was tested with the galvanometer during its continuance, as in the case of the plate formed by Planté's method, with the following

Initial strength of current	100
After 1 day's repose	92
" 3 " "	79
" 4 " "	34
" 5 " "	24
" 7 " "	11
" 9 " "	8
" 12 " "	1

It is evident from these observations that a lead-peroxide plate gradually loses its energy by local action, and that the rate varies according to the circumstances of its preparation.

Two difficulties will probably present themselves to any one on first grasping the idea of this local action: 1. Why should a lead plate covered with the peroxide and immersed in dilute sulphuric acid, run down so slowly that it requires many hours or even days before its energy is so seriously reduced as to impair its value for practical purposes? In the case of the copper-zinc couple immersed in the same acid, though the difference of potential is not so great, a similar amount of chemical change would take place in a few minutes. 2. In a Planté or Fauré battery the mass of peroxide which is in contact with the metallic lead plate expends its energy slowly. How it comes to pass that if the same mass of peroxide be brought into connection through the first lead plate with another lead plate at a distance, it expends its energy through the greater length of sulphuric acid in a tenth or a hundredth part of the time?

The answer to these two questions is doubtless to be found in the formation of the insoluble sulphate of lead, which clogs up the interstices of the peroxide and after a while forms an almost impermeable coating of high resistance between it and the first metallic plate.

The following conclusions seem warranted by the above observations:—

In the Planté or Fauré battery local action necessarily takes place on the negative plate, with the production of sulphate of lead.

The formation of this sulphate of lead is absolutely requisite in order that the charge should be retained for a sufficient time to be practically available.

The rapidity of loss during repose will depend upon the closeness of the sulphate of lead, and perhaps upon the other mechanical conditions. These are doubtless susceptible of great modifications. We do not know how far they are modified in practice, but it is conceivable that still greater improvements may yet be made in this direction.

J. H. GLADSTONE.
ALFRED TRIBE.

The Electric Light vs. Gas in Theaters.

It is said that a marked improvement has been noticed in the acoustic properties of the Grand Opera House, Paris, since the introduction of the electric light. A layer of heated gases acts as a screen for sound, hence the volumes of hot fumes arising from the old gas foot-lights obstructed and marred, to some extent, the voices of the singers. With the electric light, inclosed in air-tight bulbs, no fumes can be emitted, and very little heat is given off. Hence it benefits the ear as well as the eye.

New Material for Ornamental Purposes.

The material known as Spence's Metal has been applied with the greatest success to many ornamental purposes. Composed principally of iron pyrites, it has the properties of melting at a low temperature and cooling rapidly. These enable it to be cast in gelatine moulds, so that the most elaborate carving, with all the under-cutting and fine work, can be reproduced in facsimile swiftly and surely. A perfectly sharp casting can be obtained by pouring this metal at a temperature of 250° F. into a gelatine mould which melts at 90°. Chilled at once, the metal forms a hard skin before the gelatine has time to melt. Afterwards, the heat of the metal melts the mould, but too late to injure the casting; and if both be allowed to cool together the mould can be used again. When taken out of the mould, the metal has much the appearance of black Wedgewood, and is susceptible of the same amount of polish. Statues and bas-reliefs of any size can be cast with accuracy, and the finest work, such as the plate of a steel engraving, or the carving of a Chinese card-case, can be exactly reproduced. Its capability of withstanding exposure to the weather renders it very suitable for the decoration of architecture.

A new species of misdemeanor, the telephonic, against which the telephonic companies or societies should place themselves on guard, is reported in Brussels papers. In that capital a false employee of a telephone company, aged about twenty-five years, has been presenting himself during the past few days at different houses, furnished with telephonic apparatus, playing the part, where he has found a telephone, of an inspector or repairer of instruments, and demanding, in his capacity as an employee of the company, a sum varying from three to five francs; this amount, he said, being due him for having regulated the apparatus.

The circulation of our next issue will be over 5,000 copies.

Miscellaneous Notes, Facts and Aphorisms.

THE NEW CAPITOL BUILDING AT ALBANY.—The report of the new Capitol Commissioners, submitted to the Senate, shows that the total expenses for construction up to Dec. 31, 1881, were $12,113,243.63. To this must be added interest paid by former Commissioners, $56,935.04, and the cost of lands purchased in addition to those upon which the Capitol stands was $626,447 62, making an entire expenditure of $12,796,626. The present Commissioners found a contract in force under which the State paid 99 cents per cubic foot of granite. This was canceled, and a new contract made at from 58 to 62 cents. The change is believed to have saved the State from $150,000 to $200,000. The stairway projected on the Senate side has not been begun. The Commissioners suggest that appropriations be made in such a way that it will not hereafter be necessary to resort so frequently to the practice of "laying off" skilled workmen as heretofore. No specific sum is suggested for next year.

THE PUBLIC DEBT.—The debt statement issued first inst. shows the reduction of the public debt during the month of January to be $12,978,836.36.

Cash in the Treasury	$246,025,468 59
Gold certificates	5,188,120 00
Silver certificates outstanding	68,999,670 00
Certificates of deposit outstanding	11,400,000 00
Refunding certificates	559,100 00
Legal tenders outstanding	346,681,016 00
Fractional currency outstanding	7,069,493 67
Cash balance available	143,901,663 21

LEATHER VALENTINES.—The sunflower is the reigning fashionable pattern in valentines. They are immense in size, and some of them are weighty, being hand-painted on sole leather and suspended by skeins of floss. *Punch* has contributed most of the mottoes for them. The prices of these leather valentines vary from $4 to $10. Some large ones, eighteen inches square, bearing a cushion of plush and satin, hand-painted sachet pockets on one side and "St. Valentine's Day, 1882," on the other, in raised script letters of silver, are selling now for from $12 to $15. There are also valentines in bon-bons and there are some candied flowers, violets and roses *glacées*, which are imported from the south of France.

A CHECK FOR $7,500,000.—Boston can beat Philadelphia on big checks. The recent change in the management of General Burt's trunk line enterprise, resulted in the delivery of a check for $7,500,000.

ELECTRIC RAILWAY.—A Bill has been lodged for the construction of an electric railway under the Thames to connect Waterloo and Charing Cross Stations. The gradients will be such that very little power will be required to work the line.

A new work of considerable interest to those engaged either professionally or otherwise with telegraphic or other electrical work has been in course of compilation this year by Mr. J. Berly. It is called "The Electrical Directory and Advertiser of England," and promises to be of great use.

The value of electrical signals was recently demonstrated at Pittsburg. The indicator showed that something was wrong, and the operator notified the proper officer in time to discover a broken rail, which the track-walker failed to observe. A similar case regarding a broken rail occurred last week on the mountain division of the P. R. R. The signals in both cases are those manufactured by the Union Switch & Signal Co.

DANIEL WEBSTER TO HIS SON.—Daniel Webster wrote to his son Fletcher, who was about to be graduated at Harvard, in 1833: "I have seldom felt so much concern about anything of the kind as I do upon your success upon that occasion. I pray you spare no pains. Do your best, and you will do well enough. I earnestly remind you of the necessity of acting with great caution in regard to all festivities. You remember what I said to you on that head, and I pray you to forget no part of it."

MISS ROSA VAN DIEMAN, of Milwaukee, has brought a suit against Adolphe Thieles because he kissed her. She claims $5,000 damages. She avers that "he then and there did seize plaintiff by the shoulders, put his arm around her neck, and did then and there kiss her," and by reason of said act the plaintiff was "greatly hurt in her feelings, and suffered and underwent great mental pain."

AN EXPERT ON BARBED FENCES.—"Yes," said the farmer, "barbed wire fence is expensive, but the hired man doesn't stop and rest for five minutes on the top of it every time he has to climb it."—*Boston Post.*

HOW THE CALF GREW.—On one of the railroads running out of Detroit, the passenger train made a sudden halt between stations the other day, and an old woman, who was traveling with the usual accompaniment of parcels, whirled herself around and inquired of the passenger behind:

"Have we colluded with anything?"

"I guess not."

"Then what did we stop for?"

"There was a calf on the track, I believe."

That satisfied her for that time, but in half an hour there was another stop to pack a hot journal.

"What on airth is the matter now?" she inquired, as she tried to push up the window.

"Nothing—nothing—only a cow on the track," he replied, as he continued his reading.

The third halt was made just outside of a station for wood, and as she heard the whistle and felt the train slowing down, she got a brace for her feet and called out:

"First calf and then a cow, and now they are going to bump right into a yoke of oxen and string us all to flinders! If they kill me, the old man won't settle for less'n $200 in cash."—*Detroit Free Press.*

WE are pleased to notice the new design and enlarged edition of the London *Telegraphic Journal and Electrical Review*. It is one of the most interesting scientific journals published on the other side of the water.

We rise by the things that are under feet;
By what we have mastered of good and gain;
By the pride deposed and the passion slain,
And the vanquished ills that we hourly meet.

The conditions of success are these: First, work; second, concentration; third, fitness. Labor is the genius which changes the ugliness of the world into beauty; that turns the greatest curse into blessing.

"Yes," exclaimed our heroine thoughtfully, "I was taught early in life to separate the true from the false, to detect sham wherever found. You know, dear, my father was an editor," That kind of settled it.—*N. Y. Commercial Advertiser.*

Simple, sincere people seldom speak much of their piety; it shows itself in acts rather than in words, and has more influence than homilies or protestations.

Chicago has a street railway line which is worked with a cable. Philadelphia is still ahead, however. It has several railway lines worked by a cabal.—*Philadelphia Chronicle.*

Act well at the moment, and you have performed a good action to all eternity.

The President of the New York Chamber of Commerce received a letter the other day from a writer in Petoskey, Michigan, wanting to know what he would give for good fenceposts delivered on the cars at that place. The writer adds that if he isn't in, or doesn't care to go into this business, will he please hand the note to some one who is. Some men do hate to advertise in the newspapers.

The following appeared lately in the *Athenæum*: "A gentleman desires occupation anywhere with modern and noble-thinking men, who aim at promotion of human progress as much as at money. Aged forty. Slightly nervous (*Hyperæsthesia vasomotorii*). Has been a physician. Has given up. Cannot work hard. Cannot bear heavy sky. Understands languages, but not music; no caligraphy, no drawing.—Address, 'Negotium.'" The advertisement has not been repeated, and we conclude, therefore, that the advertiser is either in an asylum, "with a light sky," or in the happy society of "modern and noble-thinking men."

A Pointed Epistle.

A correspondent of the Detroit *Free Press* writes from Gardenland, Montana Territory: Much has been said and written in regard to the light estimate placed upon the value of human life at our frontier settlements, and the readiness of the inhabitants to resort to the pistol and knife to settle all differences. While this is in a great measure true, people cannot but regard it sometimes a benefit, as it rids the community of desperate characters with less expense than the trial of Guiteau.

A few years ago a gentleman, now a legislator, had a "trading fort" some distance north of Fort Benton, Montana Territory. In June he started to Fort Benton on business, and told the employee whom he left in charge to take good care of the "garden," and to write to him occasionally. This employee was an Irishman, but spoke French, and was known by the sobriquet of "Froggy."

Here is a copy of the first letter received by the proprietor:

BADGER CREEK, July 4, 187—.

H. K., Esq., Fort Benton.

DEAR SIR: ——— ——— came into the fort and said he was "chief." I shot him. He's dead. The potatoes look well.

Yours, FROGGY.

I think in point of terseness this letter stands unrivalled.

The Great Lakes.

Lake Erie is only sixty or seventy feet deep; but Lake Ontario, which is 500 feet deep, is 230 feet below the tide level of the ocean, or low as most parts of the Gulf of St. Lawrence; and the bottoms of Lake Huron, Michigan and Superior, although the surface is much higher, are all, from the vast depths, on a level with the bottom of Ontario. Now, as the discharge through Detroit River, after allowing all the probable portion carried off by evaporation, does not appear by any means equal to the quantity of water which the three other lakes receive, it has been conjectured that a subterranean river may run from Lake Ontario. This conjecture is not improbable, and accounts for the singular fact that salmon and herring are caught in all the lakes comununicating with the St. Lawrence, but in no others. As the Falls of Niagara must always have existed, it would puzzle the naturalists to say how these fish get into the upper lake without some subterranean river; moreover, any periodical obstruction of the river would furnish a not improbable solution of the mysterious flux and reflux of the lakes.

Elections and Appointments.

American Society of Civil Engineers.—At the annual meeting in New York the following officers were chosen: President, Ashbel Welch, Lambertville, N. J.; Vice-Presidents, James B. Eads, St. Louis, and William H. Payne, Brooklyn; Secretary and Librarian, John Bogart, New York; Treasurer, J J. R. Croes, New York; Directors, Thomas C. Keefer, Ottawa, Canada; Col. Thomas L. Casey, Washington; Joseph P. Davis, New York; George S Greene, Jr, New York, and George W. Dresser, New York.

Engineers' Club of Philadelphia.—At the annual meeting the following officers were chosen for the ensuing year: President, Rudolph Herring; Vice-President, Percival Roberts, Jr.; Secretary and Treasurer, Howard Murphy; Directors, Strickland Kneass, Frederic Graff, T. M Cleeman, J. J. De Kinder, Winfred Lewis.

Engineers' Society of Western Pennsylvania.—At the annual meeting in Pittsburgh, the following officers were chosen: President, A. Gottlieb; Vice-President, William Thaw, Jr.; Directors, A. Dempster, M. V. Smith; Secretary, J. H. Harlow; Treasurer, A. E. Frost.

The Grand Royal Arch Chapter of the State of New York elected the following officers:

James D. Pollard, of Seneca Falls, Grand High Priest; James E. Morrison, of New York, Deputy Grand High Priest; Richard H. Huntington, of Adams, Grand King; Richard H. Parker, of Syracuse, Grand Scribe; John S. Dickerman, of Albany, Grand Treasurer; Christopher G. Fox, Grand Secretary; the Rev. J. Byron Murray, D. D., Grand Chaplain.

Rope Fire Escapes Ordered.

BOSTON, Mass., Feb. 10, 1882.

A notice was issued by the Fire Commissioners today ordering rope fire escapes to be placed upon all workshops and manufacturing establishments, not already provided therewith, where five or more operatives are employed above the second story.

We would call attention of our readers to the advertisements of the Bishop Gutta Percha Works, the Western Electric Mf'g Co., and Holmes, Booth & Haydens, herein, who are the leading manufacturers of this country of Telephone, Telegraph, and Electrical supplies. We think you will find it to your advantage to make a note of same.

If you desire to keep pace with the daily progress and development of telephone matters, have a copy of the New York REVIEW OF THE TELEGRAPH AND TELEPHONE sent to your address. Only *two dollars* per annum.

The progress of the different systems of Electric Lighting will be carefully investigated and set forth to the readers of this REVIEW, and no item of interest to those concerned will be omitted.

This paper will be devoted to the sole purpose of keeping you conversant and thoroughly posted on all topics of an electrical nature, which may be brought out from time to time, in this country and Europe.

Manufacturers and dealers in Telephone, Telegraph, and Electric Light supplies will find it very much to their interest to advertise in this paper.

Everything worth noting of interest to the patrons of THE TELEPHONE AND THE TELEGRAPH will be found in this paper.

All persons ordering articles advertised in our columns will do us and our advertisers both a great favor by mentioning that they saw the advertisement in this paper.

London Electrical Exhibition.

Preparations for the forthcoming Electrical Exhibition are drawing their slow length along. The only really complete exhibit at present is that of the Postmaster-General, and this, as an historical exhibit, is very good indeed. The South-Eastern Railway also made a very good show, and the Electric Light and Power Generator Company are in position; but much remains to complete the Exhibition, and it will be another fortnight before it can be considered ready for inspection. On the evening of the 17th inst., the Edison lamp was shown in operation. The Concert Room was illuminated by over 200 of these pretty little lamps, each of which gives 16 candle-power. An extremely handsome chandelier was erected in the center of the room, and its effect was very brilliant. The steadiness and uniformity of the Edison incandescent lamp is very marked, and it compares in this respect very favorably with the Swan and the Lane-Fox lamps. A large party gathered together and dined between the rays of this brilliant light, but, as it very often happens under such circumstances, an accident occurred which put out the lights for nearly an hour. This was, however, the fault of the engine, the safety-plug of which had blown out. The Exhibition generally produced a very favorable impression —*Nature.*

The electric lighting of the Postoffice at Philadelphia has been perfected by the addition of sixty Maxim incandescent lamps, which are used in the private offices and behind distributing tables that are in the shadow of the more powerful lights suspended from the ceiling. They were used on the evening of the 24th ultimo for the first time, and their illuminating qualities gave satisfaction to the employes.

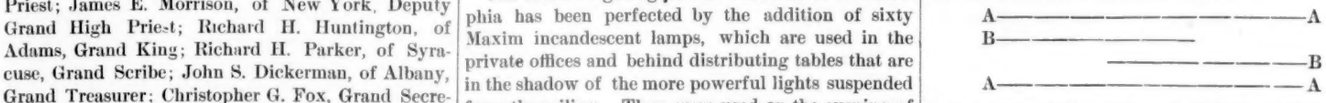
Applying the Telephone to a Train in Motion.

For some time past a series of experiments have been carried on over a portion of the track used by a dummy line of steam cars in the neighborhood of this city. The experimenter is a gentleman who resides in the suburbs, and the object of his endeavors is the perfection of a device to prevent collisions on railway lines. Yesterday afternoon he was found in his private office busy with a model, comprising a section of miniature track, with two tiny locomotives upon it. When asked about the invention, he said:

"Well, I have not yet got the patent papers in my pocket; but they have so far advanced that there is no danger of infringement, so I will explain it to you. The objects of this invention are, primarily, to prevent collisions and other accidents on surface and elevated railroads, and generally to facilitate the safe management and rapid movements of trains and locomotives. The secondary objects are to give notice automatically to each engineer of two or more locomotives in motion of their approach to each other, by means of apparatus located in the cabs of the locomotives or by the side of the track or both, and this during fogs, snow storms, in darkness and in spite of any obstruction to vision as completely as in clear weather and in the absence of such obstructions; to enable such notices to be given at will, either on the alarm bell or by telegraph or telephone, from stations on the line to engineers in the cabs of moving or standing locomotives; to enable employees, by means of a crowbar or other piece of iron, to signal for any purpose to engines in motion or standing on the line; to communicate orders and messages between engines in motion or standing, between persons and such engines and between persons on the track and the engines or stations. This plan, besides being very simple and inexpensive, is far more effective and reliable than the 'block' system, which is dependent upon signals addressed to the eye of the engineer and made from a signal station erected alongside the track, which signals are rendered ineffectual by fog, by heavy snow storms and other causes, and through the occasional oversight of the engineer, whose attention may for the moment be diverted to some matter of detail connected with the management of his engine.

THE DEVICE.

"Now you want to see the details. Well, each locomotive has hanging on its cab a small battery and alarm gong. One wire of the battery goes to the engine itself and so communicates with the track, while the other goes to a steel brush something like a whisk broom, which extends down to a third rail or iron strip which is laid upon a strip of wood running from tie to tie along the line. Now, you see the circuit is open all the time, and if another locomotive comes upon the same track a complete circuit is formed and both gongs set at work ringing. Now the application of this is manifold. The whole line is divided into sections, as in the present block system. These sections may be very long on straight roads where there is unobstructed vision, but on roads with many turns and with portions of the road bed hidden by rocks they could be as short as caution should dictate. Where two sections meet, the central rail or electrical conductor is double, one strip lying alongside the other for a distance, thus: –



A A represents the track and B B the strips to be laid down. A train in the center would notify any train ahead of its approach, at the same time receiving notice itself of a train coming upon it, would, in turn, receive and give notice of its approach. We have found that the best conductor is a strip, something like hoop iron, only a trifle heavier. That would be only about track high on the road bed, or where wagon roads cross the rails a heavier bar or actual rail could be inserted for strength.

"In our experiments it was discovered that by using a telephone receiver alongside the gong a verbal message could be sent from one engineer to another, and only the noise of the engine prevents two engineers in motion from carrying on a conversation so long as they are on the same section. You see there are no wires of any kind, only the three Léclanche cups, and the gong in each cab, costing say $25, and the laying down of the central metallic strip which could be done for less than $1,000 per mile. There would be no disturbance of the tracks, as there is in the block system, which compels an outlay of about $15,000 per mile to introduce. We do not depend upon any special personal care on the part of employees. We could have several of the gongs on each train if necessary, and to see that they are in working order at all times a section of the track – say near the round house—could be used as a testing space, and with a galvanometer the strength of the battery could be determined. A set of cups would last for months, and by a positive and negative hoop in the cab the box, with a fresh set of cups, could be placed in as readily as a fresh lamp in a car. Suppose there are two roads crossing each other. For a safe distance either way from the junction they could be turned into an electrical section, and engineers could not dash their trains into each other. A tunnel could be protected in this way, and an engineer approaching it would know that there were no obstructions within it."—*N. Y. Herald.*

Total earnings of forty-nine of the railroads of the country during January is $17,596,489, or $3,529,944 more than was earned in January, 1881.

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WHAT'S IN A NAME?—I met a Bohemian friend on the street recently with a pick in his mouth. "Ah," said he, striking his corpulent front, "big find! tony banquet! l'eau en vient a la bouche; vol au vent kidneys, fillet de clam, pate de foie gras, poisson hache, tripe au vin aigre, hote paba vulgares."

"Or, in other words," said I, "It makes your mouth water to think of it. You had a free lunch at ten cents, consisting of stewed kidneys, goose liver pie, stuffed clams, fish hash, sour tripe, and bean pie." He replied, "Just as you say, only it tastes better in French."

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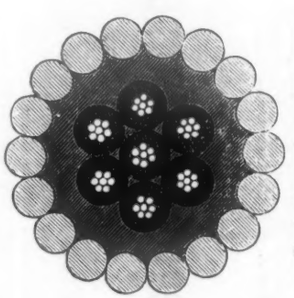

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